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List of the PSEUDONEUROPTERA of Illinois contained in the Cabinet of the writer, with descriptions of over forty new species, and notes on their structural affinities.

BY BENJAMIN D. WALSH, M. A.

[N. B.—Except where otherwise stated, the following species have been taken by myself within four miles of the city of Rock Island. None of my specimens are alcoholic. The species with an exclamation point (!) affixed have been kindly identified by Dr. Hagen, the author of the Smithsonian Synopsis of American Neuroptera, from duplicates which I sent him in 1860; but to prevent possible mistakes I have compared most of them with his diagnoses.]

TERMITINA.

TERMES FLAVIPES, Kollar, South Illinois.

PSOCINA.

♀♀ "Tarsi two-articulate, discoidal cell closed, quadrangular." (Psocus, Subgenus C, Hagen.)

PSOCUS VENOSUS, Burm.! P. CONTAMINATUS, Hagen! (South Illinois.) P. NOVÆ SCOTIÆ, Walker! P. LICHENATUS, Uhler (auctore ipso). This last species is not included in Dr. Hagen's synopsis.

PSOCUS PURUS, new species.—Head cinereous, with a large fuscous spot on the posterior nasus, a small round one on the ocelli, and two on the occiput, which are sometimes almost obsolete; antennæ black, with three basal joints whitish. Thorax and abdomen black, with the sutures whitish. Legs whitish; knees and tarsi a little fuscous. Wings hyaline, except a small black spot on the middle of the posterior margin; veins black, except the posterior side of the discoidal cellule and basal half of 1st sector, which are white; pterostigma triangular, hyaline, with a small fuscous spot at its basal angle; its nervures black, except the basal half of the inner nervure, which is conspicuously white; posterior wings hyaline, with violet reflections.

Length to the tip of wings $6\frac{1}{2}$ millimetres. Expanse of anterior wings 12 mill. Described from three specimens.

PSOCUS SEMISTRIATUS, n. sp.—Head yellowish cinereous; nasus sometimes conspicuously, sometimes obscurely, lineated with black; in one specimen entirely black; a small black spot on the ocelli; eyes ♂ globose, prominent; antennæ fuscous, two basal articulations, and sometimes part of the third, pale; antennæ ♂ with the seta hairy. Thorax and abdomen black, with the sutures whitish. Legs pale, with the tarsi, and sometimes the tips of the tibiae and the femora, a little fuscous. Wings entirely hyaline, except a small fuscous spot on the middle of the posterior margin; veins black; pterostigma triangular, rounded behind, more or less fuscous, sometimes almost black, always with the basal angle paler; posterior wings hyaline, with green reflections.

Length to tip of wings 4—5 mill. Expanse of anterior wings 7—9 mill. Described from eighteen specimens.

PSOCUS PERPLEXUS, n. sp.—♀ Differs from the above in size, in the greater proportional length of the antennæ, which extend beyond the wings, in the ocelli being much wider apart and not connected by any black spot, and in the pterostigma being of uniform fuscous color and proportionally longer and not rounded behind.

Expanse of anterior wings 11 mill. One ♀ specimen. The discal bifurcation of the anterior wing is peduncled, but this is occasionally seen in *semistriatus* mihi.

PSOCUS POLLUTUS, n. sp.—Head yellowish cinereous; front with a round discal
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black spot, and an oblique whitish line on each side near the eyes; nasus obscurely lineated with fuscous; antennæ fuscous. Thorax fuscous, with whitish sutures. Legs pale, with knees and tarsi fuscous. Wings hyaline; an irregular band on the apical margin, connected with the pterostigma by about four irregular spots, an irregular median band attaining the costa, and the base of the costa, fuscous; veins black, except the posterior side of the discoidal cellule, and a small spot at the furcation of the 1st sector, which are white; pterostigma fuscous at tip, at base hyaline; posterior wings hyaline, with violaceous reflections.

Length to tip of wings 4 mill. Captured one specimen in South Illinois.

PSOCUS AMABILIS, n. sp.—Head dull luteous, immaculate; antennæ robust, pubescent, fuscous, with two basal joints and the base of joints 3–6 pale. Thorax and legs dull luteous, the tarsi a little fuscous. Wings hyaline, with a black spot on the middle of the posterior margin; pterostigma hyaline, truncate at tip, with a black spot at its base; veins black, except the discal bifurcation, which is white. This bifurcation is not angular, as in all the above species, but rounded and peduncled, as in the species figured in Westwood's Introduction (ii. p. 18, fig. 8); from which, however, this species differs by its two-jointed feet, closed discoidal cellule, and the presence of a posterior marginal cellule.

Length to tip of wings not quite 3 mill. One specimen, found dead in the room where I keep my insects.

§2 "Tarsi two-articulate, discoidal cellule open, absent." (*Psocus*, Subgenus D, Hagen.)

PSOCUS ABRUPTUS, Hagen! *P. CORRUPTUS*, Hagen. *P. AURANTIACUS*, Hagen.

PSOCUS GEOLOGUS, n. sp.—Yellowish brown, ranging to almost black. Eyes normal; antennæ normal, villose, fuscous. Feet pale, with the tarsi and tips of tibiæ sometimes fuscous. Wings hyaline, all with golden reflections; veins black; pterostigma triangular, rounded posteriorly, hyaline, with a small spot at the basal angle; posterior marginal cellule semicircular.

Length to tip of wings $1\frac{1}{2}$ mill. Ten specimens, found in the drawers of a geological collection, into which paper had been pasted. Very near *salicis*, Fitch, but distinguishable at once by the pterostigma not being truncate.

The normal neurulation of *psocus* is, apparently, a discal bifurcation with the anterior furcation throwing out one branch and the posterior one throwing out two, in each case towards the margin. In the groups with the discoidal cellule closed, the posterior furcation seems at first sight to throw out three branches instead of two; but this is in reality caused by the submedian nervure, which closes the discoidal cellule by uniting with the posterior furcation, afterwards leaving that furcation and running to the margin. Any one may convince himself of this fact by comparing those species where the submedian nervure comes very close to the posterior furcation, but does not quite touch it, with those where it does actually touch it. What I have here called the discal bifurcation seems analogous to the "sectors" of the "arc" in the *odonata*; and the cross-vein from which it rises analogous with the "arc" itself. Dr. Hagen has observed, that "the reticulation in *P. abruptus* and *P. corruptus* is abnormal, and may constitute a distinct subgenus or rather genus." At first sight there seems to be a *tri-* not a *bi-* furcation in these species, or in other words, three sectors to the arc instead of two. But a closer inspection will show that there are in reality only the normal number—two—the anterior one throwing out its branch a short distance from the arc, and the posterior one throwing out at the usual distance one branch instead of two, which is the only abnormal feature in the neurulation of these two species.

PERLINA.

PTERONARCYS NOBILIS, Hagen. *PERLA* (*Acroneuria*) *ABNORMIS*, Newm.

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§§ PERLA. Subgenus ACRONEURIA.

ACRONEURIA RUPINSULENSIS, n. sp.—♀ Obscure luteous. Head broader than the prothorax, bright testaceous, the epistoma scarcely excavated; a transverse line at tip, a raised discal line in the form of an M with its sides divaricate, and a subobsolete basal line commencing at the eyes and curving backwards, fuscous; the usual two interocular tubercles oval, oblique; palpi fuscous; antennæ fuscous, with the joints from 2 to about 7, and the first joint beneath luteous. Prothorax nearly twice as wide as long, subcordate, anterior and posterior angles acute, excurved, the sides nearly parallel before the middle, gradually contracted behind the middle, the prothoracic episternum not thrust underneath as in other Perlæ, but distinctly visible behind from above, so as to give at a distance a quadrangular appearance to the whole prothorax; the middle longitudinal stria acute, surface rugulose, luteo-fuscous with fuscous rugæ. Prosternum and anterior half of metasternum bright luteous. Legs luteous, with obscure fuscous vittæ. Abdomen and venter with obscure fuscous markings; abdominal setæ luteous, annulate with fuscous towards their tips, not pilose except under the lens; ♀ antepenultimate ventral segment regularly rounded, so as at the centre, where it is slightly emarginate, to cover one half of the penultimate segment, with a subobsolete linear transverse tubercle before the apex. Wings subhyaline; veins of anterior wings mostly brown, of posterior mostly clay-yellow; the vein accessory to the subcosta in the anterior wing throwing out four branches, one of which occasionally becomes bifid; in one specimen the veins on the posterior apical submargin are obsolete; from four to thirteen subterminal cross-veins.

Length to tip of wings ♀ 39 mill. Alar expanse ♀ 64—71 mill. Length of abdomen ♀ about 9 mill. The ♂ I have not yet met with. Described from two specimens.

Differs from *abnormis* in the greater relative width of the prothorax, in its sides not being straight, and its not having any luteous dorsal line. Also in the greater extension of ♀ antepenultimate ventral segment, and its having a subterminal tubercle. From *ruralis* and *arida* it differs in the accessory subcostal being 4 (not 5 or 3) branched.

§§ PERLA. Subgenus A.—Accessory vein two-branched; three ocelli.

PERLA FLAVESCENS, n. sp.—Clay-yellow. Head a little broader than the prothorax, bright clay-yellow, with a divaricating unequal carina proceeding from each side of the anterior ocellus to the anterior sub-margin, where there is sometimes a large dilated puncture on each side; a large quadrangular fuscous spot at tip, and another at the base, from which last issue two wide branches nearly attaining the base of the antennæ, the two spots sometimes almost confluent; palpi fuscous; antennæ fuscous, second joint luteous, third to about the eighth luteous annulate with fuscous; the under side of the head is more or less fuscous at base. Prothorax rugose, entirely fuscous, its breadth exceeding its length by one-half, considerably narrowed behind, with its sides straight, its anterior angles acute, and its posterior ones a little rounded; meso- and meta-thorax brown-black, polished, with clay-yellow margins. Legs clay-yellow, femora sometimes vittate beneath, and always strongly above, with brown-black, a triangular spot at their tips confluent with the upper vitta, and the posterior femora fuscous at base; tibiæ vittate above with fuscous; tarsi fuscous. Sternum fuscous almost entirely. Abdomen ♀ sometimes fuscous only at the sides and tip, sometimes with the base of each segment fuscous; abdomen ♂ with the 3 or 4 basal segments clay-yellow and the rest fuscous; venter in both sexes obscure luteous, banded with fuscous; setæ brown-black, pubescent; ♂ last few abdominal segments are curved upwards, and the last, which is small and only visible at the sides, triangularly open above; ♀ antepenultimate ventral segment is semicircularly produced in the middle, so as to cover one-
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half of the penultimate. Wings subflavescent, the subcostal vein and its accessory brown, the rest mostly luteous.

Alar expanse ♂ 26—29 mill., ♀ 35—40 mill. Length ♂ $3\frac{1}{2}$ —4 mill., ♀ 4—6 mill. Four ♂, three ♀. Allied to *P. capitata*, Pictet, but distinct. In one ♂ and one ♀, the accessory subcostal of one wing is only one-branched. In ♂ of this species the 5th abdominal segment is semicircularly elongated, so as to conceal almost entirely the upcurving abdominal joints 6—8, and the 9th ventral is entirely concealed by the 8th, which is large.

PERLA VARIANS, n. sp.—Fuscous. Head as wide as, or wider than the prothorax in some specimens, with the usual divaricating carinæ equal and polished, and obscurely returning in the form of an inverted W; epistoma longer than usual, with a dilated puncture on each side; occiput with a semicircular or transverse yellow or luteous spot, which is never longer than wide, and sometimes extends to the sides of the head; beneath luteous; palpi and antennæ fuscous. Prothorax nearly twice as wide as long, quadrangular, not contracted behind, the sides straight, the angles acute before, scarcely rounded behind, rugulose, with a yellow or luteous vitta in the middle, and a more or less obvious submarginal luteous cloud on each side. Sternum luteous. Legs luteo-fuscous, with coxæ, trochanters and knees luteous. Abdomen with the last joint luteous; venter obscurely marked with luteous on the disk and sometimes the tip. Setæ fuscous, sometimes with a few basal joints luteous; ♀ antepenultimate ventral segment semi-oval behind, sometimes a little angulated in the middle, almost entirely covering the penultimate segment. Wings subhyaline; veins of anteriors brown, with a small brown cloud on the anterior part of the "arc," which is never entirely obsolete; veins of posterior wings partly luteous.

Length to tip of wings 14—18 mill. Alar expanse 28—36 mill. Length of abdomen $5\frac{1}{2}$ —8 mill. It comes very near to *P. postica*, Walker, but that species has the occipital spot hastiform, and no subcostal spot on the wings. Described from eleven specimens. The species is remarkable for having almost always a cross-vein behind the accessory subcostal vein and outside the "arc," so as to form there a trapezoidal or pentagonal cell. Sometimes this cross-vein is present in one wing in the same individual, and absent in the other; in one specimen there are on one side three additional subapical cross-veins, making four altogether, thus approximating to *Acroneuria*, and none at all on the other side. The accessory subcostal vein is incurved at its origin, and generally appendiculated there; and is further remarkable for sometimes throwing out only one branch, sometimes as many as three, the wing being often normal on one side and abnormal on the other.

In the ♂ the 9th ventral segment is distinct, and never concealed by the 8th. In the ♀ the 7th abdominal segment is prolonged laterally much beyond the other abdominal segments, so as to partially cover the base of the antepenultimate ventral.

PERLA DECIPIENS, n. sp.—Bright clay-yellow, sometimes verging on orange. Head wider than the prothorax, with a square black spot enclosing the ocelli, and a smaller round submarginal one before, which are sometimes almost confluent, sometimes obscure fuscous, sometimes, but not often, obsolete; the usual divaricating carina is generally a little depressed in the middle of each branch and scarcely returns backwards; palpi and antennæ fuscous, the latter luteous joints 2—8. Prothorax one-third wider than long, rugulose, quadrangular, its sides straight, very slightly narrowed behind, anterior angles acute, posterior ones scarcely rounded; fuscous or obscure, always with a narrow central yellow or luteous vitta; meso- and meta-thorax more or less obscured with fuscous. Legs clay-yellow, with a fuscous vitta above on the femora and tibiæ, and the tarsi fuscous. Abdomen sometimes a little varied with fuscous, especially above, in one mature specimen entirely fuscous above and below. Setæ hairy,

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a little fuscous towards their tips; ♂ with the last ventral segment invisible; ♀ with the antepenultimate ventral segment truncate, sometimes longitudinally striate in the middle, sometimes rounded and dehiscent. Wings ♀ hyaline, hind wings sometimes with violaceous reflections; veins ♂ ♀ brown, except the costal and subcostal veins and their cross-veins which are yellowish-hyaline in both wings; two or three apical costal cross-veins. In one specimen the subcostal accessory vein throws off but one branch on the right wing, thereby approximating to subgenus C. In ♂ all 4 wings are subfumose.

Length to tips of wings 10—13 mill. Expanse of wings 19—25 mill. Length of abdomen 3—4 mill. Eleven specimens. May be easily confounded with *Chloroperla bilineata*, Say (noticed below,) but is always distinguishable at once by the sides of the prothorax being fuscous or obscure, never yellow. It differs from *P. placida*, by the prothoracic vitta and by the costal neurulation being almost hyaline, so that the cross-veins are seen with difficulty; from *P. occipitalis* by the vitta, and also by having three ocelli; and from *P. dilaticollis* by having three ocelli, and by the accessory subcostal vein not being incurved. The 8th ventral segment ♂ is large, the 9th being concealed by it. no appearance of any suture.

♀♀ PERLA, subgenus B. Accessory vein two-branched; two ocelli.

PERLA OCCIPITALIS? Pict.—♀ Luteo-fuscous. Head wider than the prothorax, bright testaceous, clouded before with fuscous and with a round black spot on the ocelli; the epistoma is scarcely excavated, and the usual divaricate carina is subobsolete; the two usual interocular tubercles are prominent and round; antennæ fuscous, except the tip of the first joint and joints 2 to about 7, which are luteous; palpi fuscous. Prothorax one-third wider than it is long, the sides very slightly sinuate, contracted behind, rugulose, the margins fuscous. Pro- and meso-sternum luteous. Legs luteous; femora and tibiæ above and also the tarsi fuscous. Abdominal setæ clay-yellow, dusky at tip; ♀ antepenultimate ventral segment truncate. Wings subhyaline, sometimes with green and violaceous reflections on all of them; veins brown, the costa and subcostal apical cross-veins yellowish-brown; accessory vein not incurved at its origin. The ♂, which is hitherto unknown, differs from ♀ in being entirely luteous beneath, and in the four wings being fumose. Abdomen and venter constructed as in ♂ *P. flavescens*.

Alar expanse 23—29 mill. Length of abdomen 3—3½ mill. Differs from *P. dilaticollis* by the subcostal vein being direct, and from *P. occipitalis* by the veins being brown, not testaceous. One ♂, four ♀.

♀♀ PERLA. Subgenus C. (New.) Accessory subcostal vein throwing out only one branch; abdomen very long; two ocelli; several subcostal apical cross-veins and several postcostal* cross-veins in the anterior wing.

The ♂, which is hitherto unknown, differs from ♀ in being entirely luteous beneath, and in the four wings being fumose. Abdomen and venter constructed as in ♂ *P. flavescens*.

PERLA PRODUCTA, n. sp. Brown. Head wider than the prothorax, with the usual divaricate carina prolonged nearly to the tip, and obscurely reverting; clay-yellow or obscure luteous, clouded with fuscous at tip, with a black or

* I apply this term to the posterior basal corner of the wing, or postcostal space (*espace postcostal*), in which sense it is used throughout the Synopsis, and in *Monographie des Calopterygines*; (see Plate I., fig 1). Mr. Uhler, probably through some clerical or typographical error, is made to say, in the Glossary affixed to the Synopsis, that "Postcostal" is synonymous with "Postcubital." That this cannot possibly be so, at least in Dr. Hagen's nomenclature, may be easily seen by any one who possesses a copy of the Synopsis. The genus *Agrion*, as distinguished from the genera *Pseudostigma* and *Meclistogaster*, which have one or two series of areoles in their postcostal space, is there characterized by having "the postcostal space simple," (p. 74); and on inspecting the diagnoses of the 47 N. A. species of *Agrion*, it will be found that they have a number of postcubital cross-veins ranging from 7 to 16.

fuscous basal quadrangle enclosing the ocelli, longer than wide and throwing off on each side at tip a small branch reaching the two interocular tubercles which are round; beneath clay-yellow or luteous obscure; antennæ fuscous, except joints 2—6 or 8, which are more or less luteous; palpi fuscous. Thorax one-third wider than long, a little contracted behind, its sides straight, anterior angles slightly, posterior ones much rounded, rugulose, luteous with fuscous markings, or sometimes entirely fuscous. Legs luteous, femora and tibiæ vittate above with fuscous; tarsi and generally the knees fuscous. Abdominal setæ clay-yellow, with long hairs; conspicuously banded with fuscous in their central portion and fuscous at tip; ♀ antepenultimate ventral segment truncate, with a triangular tubercle sometimes apparently bifid at its apex; ♂ last abdominal segment small and only visible laterally. Front wings hyaline, with a slight brownish tinge; veins brown, a little lighter on the costa; from two to five subcostal apical cross-veins; accessory vein direct; from two to four postcostal cross-veins. Hind wings hyaline, the veins pale, except at the tips.

Length to tip of wings 12—17 mill. Alar expanse 21—29 mill. Length of abdomen $3\frac{1}{2}$ — $6\frac{1}{4}$ mill. Twelve specimens. I obtained a single specimen at Chicago which has the accessory subcostal in one wing two-branched. In more than fifty Rock Island specimens which I have examined, it is one-branched in both wings. The tip of the 8th ventral segment ♂ is luteous, and conceals the 9th.

PERLA FUMIPENNIS, n. sp.—Differs from the preceding in the anterior and posterior wings being distinctly and equally subfumose, the veins fuscous, and as dark in the hind as in the front wings; and also in the costa of both wings being yellowish. The head is bright clay-yellow, the spot enclosing the ocelli black, and the thorax is brown-black, immaculate. Three postcostal cross-veins.

Alar expanse 17 mill. Length abd. $4\frac{1}{2}$ mill. One ♂ specimen.

♀♀ *PERLA*. Subgenus D.—Differs from the preceding only in the ocelli being three in number.

PERLA ELONGATA, n. sp.—♂ Differs from the ♂ of *producta* in being one-third larger, in the antennæ and setæ being fuscous, immaculate, and in the prothorax having a wide clay-yellow vitta on each side the middle, extending outwards on the anterior and posterior margins. The head is clay yellow, with the spot enclosing the ocelli black; subcostal apical cross-veins 2—4; postcostal cross-veins 4—5.

Alar expanse ♂ 23—25 mill. Abdomen ♂ 5— $5\frac{1}{2}$ mill. Three ♂; ♀ unknown. The prothoracic markings resemble those of *P. nigrocineta*, Pictet, but that species is larger, has only two ocelli, and is, besides, arranged as having the accessory subcostal two-branched. The 9th ventral ♂ is concealed by the 8th, which has at its tip a large, smooth, transversely oval tubercle, with a striated outline, as in ♂ *Acroneuria abnormis*.

♀♀ *PERLA*. Subgenus *CHLOROPERLA*.

CHLOROPERLA BILINEATA? Say.—The epistoma has generally, as Say describes it, "an obscure triangular spot," or is more or less clouded with fuscous, but I have not seen a specimen "with two straight fuscous lines before the discal ones" on the head, as described by Dr. Hagen. Neither are the veins "testaceous," as Dr. Hagen describes them, except on the disk and tip of the front wings; elsewhere they are yellowish-hyaline. For these reasons, and because I believe I forwarded specimens of my species to Dr. Hagen in 1860, and he reported them to me as "*Chloroperla*, new species," I conjecture that my insect is the true *bilineata*, Say, and that Dr. Hagen has described under that name a different insect, or at all events a geographical race of Say's species. Say indeed states that "the scutellum is bimaculate, spots blackish, placed transversely," which is not the case in any of my specimens, and is not stated to be the case in Dr. Hagen's diagnosis. But this is so contrary to the general style of ornamentation in *Perlina*, that Say was probably mistaken, and mistook a cloud for two spots. In my specimens the meso- and meta-thorax are luteous, more or less obscurely clouded with fuscous.

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Sometimes in my species the head is pure yellow, with only the eyes and ocelli black. The abdomen is sometimes pure yellow, sometimes with a wide fuscous band in the middle, sometimes entirely fuscous. But the prothoracic vittæ are always distinct. The ♂ has the last abdominal joint small, internal.

The ♀ antepenultimate ventral segment is triangularly extended so as to completely cover the penultimate. The 9th ♂ ventral is apparently concealed by the 8th, which is very large and triangularly extended at tip, with no appearance of any suture.

Length to tip of wings 11—14 mill. Alar expanse 21—27 mill. Length of abd. 3—4 mill. Twenty specimens.

CHLOROPERLA BRUNNIPENNIS, n. sp.—Brown-black. Head much wider than the prothorax; ocelli three; epistoma generally luteous; antennæ luteous at base. Mouth, base of abdomen, and all beneath, generally obscure luteous. Prothorax rather wider than long, its sides straight, contracted behind, its angles slightly rounded. Setæ luteous at base, sometimes all but their tips luteous. Antepenultimate segment ♀ venter covering $\frac{1}{2}$ the penultimate. Legs luteous, femora with a broad median black band, sometimes interrupted beneath, especially in the front legs; tibiæ black on their basal half, sometimes luteous beneath, especially in the front legs. Wings all brownish, the costa yellowish; veins the color of the wing; front wings with a streak between the postmedian and postcostal veins, and the region of the origin of the accessory subcostal, hyaline.

Alar expanse 16—21 mill. Length abd. $3\frac{1}{2}$ —4 mill. Two ♂ one ♀.

CHLOROPERLA NANA, n. sp.—Differs from the above in size, in the head being immaculate above and below, and in the prothorax being one-half wider than long, its angles rounded, and with a broad, median, luteous vitta. The hyaline streaks on the wings are absent.

Length to tip of wings $6\frac{1}{2}$ mill. Alar expanse $11\frac{1}{2}$ mill. Abd. 2 mill. One ♀? specimen.

ISOPTERYX CYDIPPE, Newman! (= *Perla imbecilla*, Say?) *CAPNIA MINIMA*? Newport. *TÆNIOPTERYX FASCIATA*, Burm.! (= *T. frigida*, Hagen?) *NEMOURA COMPLETA*, Walker.

EPHEMERINA.

(Anterior tarsi always five-jointed; the others generally five-jointed, but four-jointed in *Ephemer* and *Cloe*.)

Cross-veins numerous; costal cross-veins numerous, robust, regular. (Wings 4, hind wings wide with numerous veins; very few short, terminal isolated veinlets at the tips of any of the wings.)	Eyes ♂ contiguous, simple. (Intermediate seta, when present, rudimental.)	First tarsal joint longer than the second, except in anterior ♂ tarsus, where they are equal.	} <i>BÆTIS</i> , subgenus A.
		First tarsal joint always longer than the second.	
		First tarsal joint shorter than the second.	
	Eyes ♂ contiguous, double. (Three subequal setæ both in imago and subimago.)	POTAMANTHUS.
	Eyes ♂ not contiguous, simple; intermediate seta, when present, short or rudimental.	Legs all short; intermediate seta short.	} <i>PALINGENIA</i> , subgenus A.
		Legs all short, except ♂ anterior legs; intermediate seta rudimental.	
		Legs all long; no intermediate seta.	
	Eyes ♂ remote, simple; three long setæ, subequal in imago, equal in subimago.	EPHEMERA.

Cross-veins less numerous; costal cross-veins, except the basal cross-vein and on the terminal $\frac{1}{4}$ of costa, almost invisible and partially absent. (Many short terminal isolated veinlets at the tips either of the front or hind wings, except in <i>Cænis</i> .)	Eyes ♂ contiguous, simple. (Wings 4, hind wings wide, with numerous veins.)	Three long and equal setæ. Three setæ, the middle one rudimental.	EPHEMERELLA, n. g. BÆTISCA, n. g.
	Eyes ♂ contiguous, double. (Wings 4 or 2; hind wings with 2 or 3 veins.)	Wings 4, cross-veins rather numerous (50 or 60.) Wings 4, cross-veins sparse (14—18.) Wings 2, cross-veins sparse (14—18.)	CLOE, subgenus A. CLOE, subgenus B. CLOE, subgenus C.
	Eyes ♂ remote, simple. (Wings 2, setæ 3.)	CÆNIS.

As it is often difficult in the dried specimen to distinguish whether the ♂ eyes are single or double, and as sexual generic characters are practically inconvenient, the following synoptical table, which excludes them, except in two subgenera, has been prepared:

Costal cross-veins numerous, robust, regular ; wings 4.	{ Setæ 3, subequal.	First tarsal joint entirely obsolete in ♂ ♀ 4 hind legs.	EPHEMERA.
		First tarsal joint indistinct and connate with the tibia in ♂ ♀ 4 hind legs, but not obsolete.	POTAMANTHUS.
	{ Setæ 3, the middle one short.)	PALINGENIA, subgenus A.
		First tarsal joint shorter than second.	PALINGENIA, subgenus B.
	{ Setæ 3, the middle one rudimental.	First tarsal joint longer than second, except in anterior ♂ tarsus, where they are equal.	BÆTIS, subgenus A.
		First tarsal joint longer than second in all ♂ ♀ legs.	BÆTIS, subgenus B.
	{ Setæ 2.	First tarsal joint shorter than second, indistinct and connate with the tibia in all ♂ ♀ legs.	BÆTIS, subgenus C.
		First tarsal joint shorter than second, distinct and free in all ♂ ♀ legs.	PALINGENIA, subgenus C.
		Three equal setæ.	EPHEMERELLA, n. g.
	Costal cross-veins, except at tip and extreme base, very slender; entirely absent on some part of the costa.	{ Wings 4, hind wings wide.	Three setæ, middle one rudimental.
Cross-veins rather numerous, (50--60.)			CLOE, subgenus A.
{ Wings 4, hind wings narrow.		Cross-veins sparse, (14-18)	CLOE, subgenus B.
		Two setæ; cross-veins sparse, (14--18.)	CLOE, subgenus C.
{ Wings 2.		Three setæ; cross-veins very sparse, (4-6)	CÆNIS.

BÆTIS.

♀♀ *Bætis*. Subgenus A.—First tarsal joint distinct, large, always larger than any of the three following, except in the anterior ♂ tarsus; joints 1-4 regularly and notably diminishing in length, except in the anterior ♂ tarsus, where joints 1-4 are long and subequal and joint 1 is distinctly free. A rudimental intermediate seta, distinctly articulate, sometimes turned downwards.

BÆTIS FEMORATA, Say.—Undescribed imago.—♂ Piceous. Eyes in the living insect pearly whitish on their superior $\frac{1}{4}$, with a moveable black spot; the inferior $\frac{1}{4}$ pale dusky, divided from the whitish part by a definite line; antennæ dusky, pale at extreme tip. Prosternum a little marked with whitish, sometimes almost entirely whitish; a broad transverse oblong whitish band between the hind coxæ, sometimes very conspicuous. Abdomen with joints 1-5 whitish hyaline, each with a narrow piceous band before the incisures, an obscure, oblong, medial spot on each side of the dorsum, and a slight piceous pulverules-

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cence above; on the lateral base of joints 6 and 7 a semi-oval whitish spot extending to their middle, and a similar spot covering the whole side of the last joint; venter whitish hyaline; anal processes whitish, sometimes with only their middle joint whitish; setæ whitish, with fuscous incisures alternately wide and narrow. Anterior legs a little longer than the body, with very long tarsi, pale brown, sometimes with the basal half of their femora brown; the four posterior legs paler; all six with a broad postmedian band on the femora, the base and tips of the tibiæ, and the tarsal incisures and tips brown. Wings hyaline; veins and cross-veins, hyaline, subequal, moderate, except the three veins of the costa, one discal sector with its basal cross-veins, and sometimes some of the other veins, which are fuscous; at the discal bifurcation of this sector there is a more or less obvious small brown spot; subcostal cross-veins fuscous, rather coarse; a coarse medial black line immediately behind the third vein of the costa, about a millimetre long, and sometimes a slight brown cloud at the costal tip; posterior wings hyaline, with hyaline veins and cross-veins, except one long and one short series of cross-veins on the basal costa, which are strongly fuscous and enclose a brown cloud.

The ♀ differs from the ♂ as follows: joints 1—5 of abdomen are piceous brown above, paler towards their base; the anterior legs, as usual in ephemeral ♀ imagoes, are shorter; and there is no basal cloud on the hind wings.

Length ♂ 12—13½ mill.; ♀ 12½—14 mill. Alar exp. ♂ 25—28 mill.; ♀ 28—29 mill. Setæ ♂ 20—24 mill.; ♀ 13—16 mill. Ant. leg ♂ 14 mill.; ♀ 9 mill. Eight ♂, two ♀.

The subimago, which alone was known to Say, is a very different looking insect from the imago; but having found a specimen drowned in the act of moulting, I succeeded in detaching the subimaginal film from the abdomen and from one wing, thus proving their identity. Say states that in ♂ "the nerves are brown and margined with brown, more particularly so at the base, middle and tip of their costal margins." This makes, of course, 3 darker clouds on the base, middle and tip respectively of the costal margin, which are more or less plain on all my specimens both ♂ and ♀, the central cloud always very distinct, the basal one the least so. Dr. Hagen has misunderstood Say's language, and abridging his description says, "veins clouded with fuscous, especially the basal discoidal and apical ones," which would make three fuscous fasciæ. It may be added to Say's description, that the antennal seta is fuscous, the basal joints pale, sometimes tipped with fuscous; that the ♂ and ♀ anterior legs are a shade darker than the posterior ones; and that besides the femoral bands, the base and tip of the tibiæ, and the tarsal incisures and tips, are also brown in all the legs. The abdominal setæ are pale brown with brown incisures, pilose at tip; and the wings are very finely ciliated behind.

Length 10½—14 mill. Alar exp. 24—32 mill. Setæ 10—14 mill. Ant. ♂ leg 9 mill. Ant. leg ♀ 8½ mill. Five ♂, two ♀.

BÆTIS ALTERNATA? Say.—♂ Piceous brown. The lower ¼ of the eyes, in the living insect, is separated from the upper ¾ by a black line; antennal seta dusky; epistoma pale. Base of scutell yellowish all round. Sternum a little marked with yellowish. Abdomen with two lateral basal triangular yellowish spots on segments 2—9 or 4—9 more or less confluent, sometimes extending to the dorsum; on joints 7 and 8 and sometimes on 6, one or both of these spots often enclose a longitudinal brown line and are much elongated; venter pale, each joint generally with a small central basal spot, two transverse medial dots and an oblique slightly abbreviated lateral line, brown; joints 1—2 and 8—9 sometimes almost brown; setæ whitish with brown incisures; anal appendages pale, generally brownish at base. Anterior legs pale brown, posterior 4 almost pale, all with the extreme base and tip and a wide subterminal band on the femora, base and tips of the tibiæ and the tarsal incisures and tips, brown. Wings hyaline, glittering, with fuscous veins and cross-veins, the veins rather fine, except the three on the costa which are quite coarse, and the cross-veins,

except the oblique basal subcostal one which is quite coarse, so very fine as to be almost imperceptible to the naked eye, giving the whole wing a very peculiar appearance. The anterior ♂ tarsus is very long; in the living insect the first joint is seen to be freely moveable.

The ♀ has two diverging carinæ between the ocelli, the anterior and lateral edges of the vertex, and sometimes its medial carina, and on each side two abbreviated vittæ, yellowish. The markings of the abdomen are occasionally indistinct.

Length ♂ 10½—12½ mill.; ♀ 10—11½ mill. Alar exp. ♂ 23—30 mill.; ♀ 26—32 mill. Length ♂ seta 19—31 mill.; ♀ 18—19 mill. Length ♂ ant. leg (one specimen) 16 mill. Ant. tarsus 9 mill.; ♀ ant. leg (same size) 8 mill. Described from fifteen ♂, six ♀. Say states that the wings are "whitish," or "hyaline with a whitish reflection." In other respects his description agrees with the ♀ of the above. Very abundant at Rock Island, and I have also taken it on Coal Valley Creek, Rock Island Co. and the Des Plaines River near Chicago.

The ♂ and ♀ subimago, with which Say was not acquainted, differ from the imago in the colors and markings being darker and more obscure, and in the wings being fumose and the veins and cross-veins coarser and more distinct. The tips of the hind wings, including the nervures, are pale greenish. As in all other subimagos known to me, the posterior edge of the wings, when held up to the light, exhibits under a strong lens a ciliated appearance, and the setæ are pilose. The ♂ anterior legs are no longer than those of ♀.

Length ♂ 11 mill.; ♀ 10—12 mill. Alar exp. ♂ 29 mill.; ♀ 29—30 mill. Seta ♂ 13 mill.; ♀ 14—15 mill. Length ant. ♂ leg 8 mill.; it tarsus 4 mill. One ♂, two ♀.

♀♀ *Bætis*. Subgenus B.—First tarsal joint large, always larger than any of the three following; in anterior ♂ and ♀ legs free, distinct; in 4 posterior ♂ and ♀ legs connate, indistinct; joints 1—4 regularly and moderately diminishing in length; no difference in the relative proportions of ♂ and ♀ anterior tarsal joints. A rudimental intermediate seta, sometimes turned downwards.

BÆTIS ARIDA? Say.—♂ Ferruginous. Head light ferruginous; ocelli not approximate, subequal; a large black spot on the inside orbit of each posterior ocellus, and a small spot on the back part of the front one; eyes in the dried specimen black, occasionally with a broad interior pale purple vitta; seta pale at tip, sometimes entirely pale. Thorax and abdomen piceous above, except the last abdominal segment, with ferruginous semicircles or triangles on the basal half of each piceous segment of the abdomen; longitudinal middle of sternum and venter piceous; seta pale greenish; anal appendages sometimes fuscous towards the tip. Anterior legs long, obscure greenish, fuscous on the terminal half of the femora and the tibial and tarsal tips, occasionally entirely fuscous, except the basal half of the tarsal joints; four hind legs greenish white, a little cloudy at the tips of the tarsi; the first tarsal joint in the anterior leg is free in the living insect. Wings hyaline; veins and cross-veins subequal, rather fine, greenish-hyaline, with a trace of fuscous at the extreme base of the costa.

The ♀ differs from the ♂ as follows: The eyes of the living specimen are ferruginous, with a broad yellowish vitta dividing them into two equal portions, in the dead specimen dark ferruginous; the vertex is yellow, sometimes with a ferruginous vitta. Except in two specimens, where the markings are similar to those of ♂, the body is of a nearly uniform ferruginous color; the anterior legs are generally marked as in the exceptional ♂ specimen; and the nervures of the wings, except occasionally on the posterior margin of the front wings, are pale fuscous. Similar sexual variations in the color of the wing veins occur in *Palingenia*.

Length ♂ 10—12 mill.; ♀ 9—13 mill. Alar exp. ♂ 22½—25½ mill.

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♀ 23½—32 mill. Seta ♂ 18—23 mill.; ♀ 17—26 mill. Length anterior leg ♂ 9½ mill.; ♀ (same size) 7½ mill. Described from six ♂, nine ♀. Say says, "Vertex with a small black spot each side on the *orbit*." Did he refer to the orbits of the ocelli? There are no other spots on the head in my species. His description was posthumously published, and lacks the word "brown" or "piceous" at the end.

The ♂ ♀ subimago, which are undescribed by Say, and from which I have bred numerous specimens of the imago, differ from the imago as follows: The ♂ body is often of an obscure grayish fuscous color, the lateral markings of the abdomen, when present, being more obscure than in the imago; in the ♀ these markings are never visible. The eyes of the living ♂ insect are separated by a narrow fissure, sometimes visible even in the dried specimen, whereas, in ♂ imago they are always contiguous. The abdominal setæ are greenish obscure, sometimes a little dusky at tip, always pilose under the lens. The anterior legs ♂ ♀ do not differ in length from one another, and are generally entirely fuscous, except the base of the first and sometimes of the second tarsal joints. The wings are clouded with dusky, especially towards the tips; veins and cross-veins dusky, rather coarse, subequal; all the cross-veins bordered with fuscous; hind wings conspicuously and widely bordered with fuscous behind.

Length ♂ 8—11½ mill.; ♀ 9—12½ mill. Alar exp. ♂ 20—24 mill.; ♀ 26—32 mill. Seta ♂ 12—14 mill.; ♀ 10—14 mill. Eight ♂, five ♀. Differs from *B. ignava*, Hagen (a subimago) chiefly in the feet not being rufous.

BÆTIS SICCA, n. sp.—♂ Ferruginous. Head light ferruginous; seta pale; eyes in the dried specimen blackish; orbits of ocelli not conspicuously darker inside. Thorax piceous; pleura ferruginous; sternum piceous. Abdomen piceous above, except the last segment; seta pale greenish, slenderly incised with fuscous; anal appendages a little darker towards the tip. Anterior legs short, piceous, except the tip of the tibia, which is black, and the first tarsal joint, which is always conspicuously pale, except at the incisures; four posterior legs pale greenish, extreme tarsal tips cloudy. Wings hyaline, veins and cross-veins subequal, rather fine, fuscous, in a very mature specimen pale fuscous.

The ♀ differs from ♂ in the thorax and abdomen being immaculate, and in the anterior tarsi being pale fuscous, except the first joint, which is pale as in ♂.

Length ♂ 8½—10 mill.; ♀ 8½—11½ mill. Alar exp. ♂ 19—22 mill.; ♀ 23—27 mill. Seta ♂ 19 mill.; ♀ 15 mill. Anterior leg mature ♂ 6 mill.; ♀ (similar size) 5½ mill. Three ♂, two ♀. May be easily confounded at first sight with *arida*, but is sufficiently distinct by the short anterior ♂ legs, the pale first tarsal joint in ♂ ♀ anterior legs and the fuscous ♂ wing-veins. This, as well as *arida*, Say, differs from *vicaria*, Walker, and *annulata*, Walker, in the four posterior legs not being two- or more banded, and in some other respects.

The ♂ ♀ subimago are scarcely distinguishable from those of *arida*, but the eyes of the living ♂ are contiguous. The species occurs a month later than *arida*.

♀♀ *Bætis*. Subgenus C.—First tarsal joint indistinct, connate, moderate, equal to about ⅔ joint 2, except in anterior ♂ tarsus, where it is about ⅓; joints 2—4, moderately diminishing in length in all ♂ ♀ legs. No intermediate seta visible, even in the living insect.

BÆTIS DEBILIS? Walker, Catal.—♂ Ferruginous. Eyes in the living insect with their lower fourth fuscous and their upper three-fourths brown, and with coarser facets; seta of antennæ dusky, pale at tip. Thorax generally piceous. Abdomen with the terminal third or half of each joint more or less piceous; anal appendages pale; seta whitish, immaculate. Legs pale greenish, with a median narrow band on the femora, and generally the knees, fuscous; the anterior legs generally with the tips of the tibia and tarsal incisures and tips fuscous; the four hind legs with only the tarsal tips fuscous. Wings hyaline; veins and

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cross veins moderate, subequal, pale greenish hyaline, except the basal third of the three costal veins, and occasionally their tips, which are fuscous; in the hind wings they are all immaculate.

The ♀ differs from ♂ as follows: The general color is paler; the thorax is generally almost yellow; the abdomen ferruginous, each joint generally darker at tip; and the wing-veins are dusky along the costa and at the tip of the wing, gradually becoming hyaline as they approach the postcostal angle.

Length ♂ 4—5½ mill.; ♀ 5—7 mill. Alar exp. ♂ 14—15 mill.; ♀ 15—16 mill. Seta ♂ 13—14 mill.; ♀ 8—11½ mill. Anterior leg ♂ 7 mill.; ♀ (same size) 5 mill. Eight ♂, eight ♀. The diagnosis of *debilis* is so brief that it is scarcely sufficient.

The ♂ subimago differs from the imago in the general color being obscure; the thorax is almost yellowish, and the abdomen obscure piceous or ferruginous, immaculate; the anterior tarsi are fuscous; the abdominal seta cloudy at tip and pilose under the lens; the wings are fumose, the veins and cross-veins fuscous, the former rather coarse, the latter moderate; and the fringe on the posterior edge of the wings is long and dense.

Length ♂ 4½—5½ mill. Alar exp. ♂ 13—15 mill. Seta ♂ about 5 mill. Anterior leg ♂ (same size as ♂ imago) 5 mill. Two ♂; ♀ unknown.

POTAMANTHUS.

POTAMANTHUS CUPIDUS, Say.—Undescribed imago.—♂ Piceous, highly polished; venter, except the penultimate joint, ferruginous; anal processes pale; setæ whitish, with fuscous incisures alternately wide and narrow on the basal half, uniform behind the middle, and towards the tip becoming very wide. Anterior legs brown, darker at the knees and the tips of the tibiae; four hind legs pale yellowish brown, immaculate. Wings hyaline, veins rather coarse, especially on the costa, cross-veins fine, the former fuscous, except on the postcosta, where they are hyaline; the latter hyaline, except at the subcostal tip of the front wing, where they are fuscous.

Length ♂ 7½ mill. Alar expanse ♂ 18 mill. Seta ♂ 18½ mill.; intermediate seta about 16 mill. Anterior leg ♂ 8 mill. One ♂; ♀ unknown.

The subimago, which alone was known to Say, and from which, after several unsuccessful attempts, I finally succeeded in breeding the ♂ imago, occurs rather abundantly on rafts of Wisconsin pine-logs from the middle of May to the middle of June, unaccompanied, so far as I could discover, by the imago. The "two divergent, abbreviated, obsolete, whitish lines" which Say mentions as peculiar to the ♂ (= ♀ apud Say) I noticed only in a single ♀, and they disappear in death.

Length ♂ 7—9 mill.; ♀ 9 mill. Alar exp. ♂ 20—26 mill.; ♀ 19—24 mill. Seta ♂ 11—14 mill.; intermediate seta ♂ 9—12 mill. Seta ♀ 8½—11½ mill.; intermediate seta ♀ 8—10½ mill. Ant. leg. ♂ 8 mill.; ♀ (same size) 7 mill. Eleven ♂, three ♀.

POTAMANTHUS ? ODONATUS, n. sp.—Piceous; sex uncertain; head, anterior legs and abdomen deficient. Posterior legs pale ferruginous, tips of tarsi cloudy. Wings hyaline; veins moderate, fuscous; paler towards base; cross-veins fine, fuscous at terminal half, hyaline at basal half; terminal one-third of anterior wing dusky, with a definite outline.

Alar expanse 25 mill. I have referred this fragmentary specimen, which I found drowned in a pool of water, to *Potamanthus*, because it agrees with that genus in its tarsal structure (which is the same as that of *Batis*, subgenus C,) and also in its peculiar neurulation,—viz.: four veins on the postcosta, the anterior one much curved, and emitting anteriorly from its centre a bifurcate vein. I am not aware that there are any other examples in *Ephemerina* of the style of ornamentation, so characteristic of the *Odonata*, which prevails in the wings of this species.

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PALINGENIA.

§§ *Palingenia*. Subgenus A.—First tarsal joint distinct in the anterior legs, indistinct and connate in the four posterior legs; legs short, hind legs not nearly attaining the tip of the abdomen; intermediate seta rather short; eyes of ♂ separated by a space as wide as the orbit of the posterior ocellus.

PALINGENIA VITTIGERA, n. sp.—♂ Yellowish. Ocelli and vertex piceous; antennæ pale ferruginous, seta whitish at tip. Prothorax piceous on its dorsum; thorax piceous to the base of the wings. Abdomen piceous on its dorsum, dorsum of each joint with two narrow, yellowish, divergent basal vittæ extending half way to its tip; anal appendages yellowish; setæ whitish, immaculate. Legs yellowish, anteriors with the base and tips of the tibiæ, and the tarsal incisures and tips fuscous; four hind legs with only the tips of the tibiæ and the tarsal tips fuscous. Wings hyaline; veins and cross-veins fine, subequal, hyaline, except on the costa, where they are coarse, the first vein fuscous at base, yellowish at tip; the second and third yellowish throughout; the costal cross veins fuscous at base, becoming yellowish towards the tip of the costa; in the hind wings two costal veins, with their connecting cross-veins, are pale fuscous.

Length ♂ 18 mill. Alar expanse ♂ 32 mill. Setæ ♂ about 40 or 50 mill. Intermediate seta ♂ 5 mill. Anterior leg ♂ 9 mill.; ♀ unknown.

§§ *Palingenia*. Subgenus B.—First tarsal joint distinct in the anterior legs, indistinct and connate in the four posterior legs; legs short, except the ♂ anterior legs, hind leg not attaining the tip of the abdomen; intermediate seta rudimental; eyes ♂ separated by a space twice as wide as the orbit of the posterior ocellus.

PALINGENIA LIMBATA, Pictet, (= No. 4, *P. bilineata*, Say, apud Hagen.) *P. BILINEATA*, Say, (= No. 5, *P. limbata*, Guérin, apud Hagen.)—An attentive comparison of Say's description with Dr. Hagen's diagnoses will, I think, satisfy any one that Dr. Hagen has wrongly identified Say's species, and that his No. 5, not his No. 4, is the true *bilineata*, Say. The following particulars in Say's description apply to No. 5, as described by Dr. Hagen himself, and not to No. 4: "Prothorax blackish each side and before;" "wings hyaline, *whitish*, with *fuscous* nervures;" [Say describes the ♀ of his species, and the ♀ of No. 4 has *yellowish* wings with *yellow* veins;] "a double series of *whitish*, *oblique*" —[typographical or clerical error for *OBLONG*?]—"dilated abbreviated lines" on the abdomen. Moreover, Say describes it as "appearing in considerable numbers." Now, No. 5 positively swarms at Rock Island every summer, and I found it in similar profusion in Southern Illinois on the Ohio River; No. 4, on the contrary, is quite rare; I have met with only nine or ten specimens in five years near Rock Island, and in Southern Illinois I did not meet with any at all. Mr. Uhler agrees with me, as appears from his note in Say's Works, (i. p. 203.)

§§ *Palingenia*. Subgenus C.—First tarsal joint distinct in all the legs, freely movable by the living insect in the anterior legs; legs all long; hind legs much more than attaining the tip of the abdomen; no intermediate seta; eyes ♂, separated by a space at least as wide as the orbit of the posterior ocellus.

PALINGENIA FLAVESCENS, n. sp.—♂ Yellowish. Ocelli fuscous; vertex ferruginous; seta dusky, whitish at tip. Thorax ferruginous, sometimes verging on piceous. Dorsum of abdomen ferruginous, joints 1—6 darker at tip, and with two subobsolete pale basal vittæ on the dorsum; venter pale greenish, except the three or four last joints; anal processes pale, fuscous at tip; setæ whitish, the incisures fuscous, occasionally towards the base alternately white and narrow. Anterior legs pale ferruginous; a medial and terminal band on the femora, tips of tibiæ and tarsal incisures and tips fuscous; four hind legs

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yellowish, with the tips of femora fuscous, and the tarsal incisures and tips a little cloudy. Wings hyaline, with a pale ferruginous cloud along the costal tip; veins and cross-veins moderate, subequal, fuscous, except the three costal veins which are coarse, yellowish on their basal two-thirds, fuscous on their terminal one-third, where the cross-veins also are coarse, the oblique basal cross-vein being always very coarse; half way to the tip the second costal vein is always thickened and obfuscated for the length of half a millimetre, sometimes obviously, sometimes indistinctly.

The ♀ is paler than the ♂; the vertex and thorax being rather luteous than ferruginous, and the dorsum of the abdomen pale fuscous, or pale ferruginous, with no appearance of any vittæ; in one specimen the setæ are immaculate, except at the extreme tip; the costal cross-veins are hyaline on their basal $\frac{2}{3}$.

Length ♂ 9—13 mill. ♀ 10—13 mill. Exp. ♂ 24—31 mill. ♀ 27—34 mill. Seta ♂ 27—38 mill. ♀ 27—28 mill. Ant. leg ♂ 13 mill. ♀ (same size) 10 mill. Eleven ♂, three ♀. Resembles *Bætis vicaria*, Walker, but differs in the coloring of the wing-veins.

The ♂ subimago differs from the ♂ imago in the vittæ of the abdomen being obsolete. The setæ are obscure greenish, immaculate, pilose; the anal processes are immaculate; the wings are slightly tinged with fuscous, and ciliated behind, and the coloring of the veins and cross-veins is not so strongly marked.

The ♀ subimago differs from the ♀ imago in the abdominal joints, 1—6 being of a deep egg-yellow, from the included eggs showing through the integument; the seta is pale, a little fuscous at tip; the wings are subflavescens, subopaque, ciliated behind; the veins yellowish, and the cross-veins also yellowish, except on the disk and tip.

Length ♂ 10 mill.; ♀ 11½ mill. Alar exp. ♂ 29 mill.; ♀ 30 mill. Seta ♂ 17 mill.; ♀ 13 mill. Ant. leg ♂ ♀ 10 mill. One ♂, one ♀.

PALINGENIA (BÆTIS) INTERPUNCTATA, Say.—♂ Yellowish. Eyes in the living insect pale greenish yellow, a black longitudinal line dividing them into two equal parts. Ocelli with fuscous orbits; a black spot on each side between the eyes, sometimes indistinct from the vertex being obfuscated; beneath each antenna a black spot, a little elongated transversely, but not angulated, except when viewed obliquely. Prothorax with a basal triangle, and a line on each side black; dorsum of thorax piceous. Abdomen pale obscure greenish; a dorsal line generally wide, sometimes narrow, and the terminal $\frac{1}{2}$ of each joint piceous; the last two or three joints almost entirely piceous; the dorsal line, when wide, incloses on joints 1—6 or 1—7 a lateral pale spot; venter pale obscure-greenish, with the tips of the segments darker; anal appendages pale, sometimes cloudy at tip; setæ pale greenish, the incisures distinctly but narrowly fuscous, except in one immature specimen. Anterior legs pale greenish yellow, with a medial and terminal band on the femora, the tips of the tibiæ and the tarsal incisures and tips fuscous; four hind legs somewhat paler, but similarly marked, except in a single specimen, where the medial band of the femora is subobsolete, and except also that only the extreme tip of the tibiæ is fuscous. Wings hyaline, clouded with yellowish brown on the costa, especially on the terminal one-third; the veins fine, except the three costal veins, which are coarse; the cross-veins rather coarse, on the costa very coarse; all fuscous, except the basal two-thirds of the three costal veins, which are yellowish; on the middle of the costa, between the third costal vein and that immediately behind it, is a very coarse black streak, about one-half millimetre long. The hind wings are always distinctly tipped with brown.

The ♀ differs from the ♂ as follows: The basal triangle of the prothorax is generally reduced to a black dot; the dorsum of the thorax is luteous. The abdomen and venter are egg-yellow, from the included eggs showing through,

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and the dorsal and terminal line of each abdominal segment is much narrower, the penultimate joints not differing in color from the others, and the last joint being whitish; the ventral joints, instead of being darker, appear paler at tip; the setæ are whitish, almost immaculate. The costa is clouded with yellowish, not darker on the tip: and the veins and cross-veins on the postcosta of the front wings, and on the whole of the hind wings, except the tip, are yellowish hyaline.

Length ♂ 7—7½ mill.; ♀ 5—10 mill. Alar exp. ♂ 18—21 mill.; ♀ 18½—29 mill. Seta ♂ 20—25 mill.; ♀ 14—24 mill. Ant. leg ♂ 10 mill.; ♀ (same size) 6 mill. Eight ♂, three ♀.

The ♂ subimago differs from the ♂ imago in the colors being paler and obscurer; the setæ are immaculate and pilose; the wings are ciliated and tinged with fuscous, or in very immature specimens opaque and tinged with yellow, and the veins and cross-veins colored as in ♀.

The ♀ subimago differs from the ♀ imago in the prothorax being generally fasciate posteriorly with black; the abdomen is generally widely vittate with fuscous, the vitta on each joint inclosing a lateral pale spot as in the normal ♂; the setæ and wings are as in ♂ subimago.

Length ♂ 6—10 mill.; ♀ 6—10 mill. Alar exp. ♂ 17—25 mill.; ♀ 20—30 mill. Seta ♂ 9—15 mill.; ♀ 7—14 mill. Ant. leg ♂ 8½ mill.; ♀ (same size) 8 mill. Five ♂, five ♀. Say states of the imago, that "the stemmata are distant," which is true of ♀, but not of ♂; and that "the setæ are immaculate," which is not generally true of ♂. Again he says, that "the abdomen at tip is more or less obviously ferruginous," which is true of the ♂, but not of the ♀; and in some other respects his description disagrees. This insect is referred by Say to the genus *Bætis*, and so is *Palingenia bilineata*.

PALINGENIA PULCHELLA, n. sp.—♂ Whitish. Eyes in the living insect pearly whitish, changing to blackish even before death; ocelli ferruginous, their orbits often blackish; seta fuscous at base, pale at tip; all above behind the ocelli ferrugino-piceous, except the meso- and meta-thoracic scutella, which are whitish, and the base of the seventh abdominal joint, and all but the extreme terminal edge of joints 1—6, which are whitish hyaline, with a large subterminal lateral fuscous dot upon each. Setæ whitish with fuscous incisures, alternately narrow and wide on the basal half. Beneath all whitish, except the sternum, which is light ferruginous, especially in front. Anterior legs pale yellowish, with a medial and terminal band on the femora, tips of the tibiæ, and the tarsal incisures and tips fuscous; four hind legs whitish, the markings the same but paler, and the medial femoral band sometimes obsolete. Wings hyaline, with a pale brown cloud on the tip of the costa; the veins fine, except on the costa, the cross-veins rather coarser, especially on the costa; all fuscous, except the basal two-thirds of the costal veins, which are yellowish; the oblique cross-vein at the base of the costa is very coarse. In the hind wings the postcostal veins and cross-veins are hyaline.

The ♀ differs from the ♂ as follows: The vertex is whitish, varied with luteous or ferruginous; the thorax is whitish, varied with luteous, and the sternum and pleura whitish. The abdomen and venter are egg-yellow, except where the eggs have been partially extruded; abdominal joints 1—6 marked as in ♂; 7—9 sometimes slightly tinged with ferruginous above, sometimes immaculate. The cloud on the costal tip is paler, and the veins and cross-veins of the hind wings are mostly hyaline.

Length ♂ 6—7 mill.; ♀ 5½—6½ mill. Alar exp. ♂ 15—21 mill.; ♀ 17—22 mill. Seta ♂ 17—21 mill.; ♀ 15—16 mill. Ant. leg ♂ 9½ mill.; ♀ (same size) 5½ mill. Twelve ♂, eight ♀.

The ♂ ♀ subimago, from which I have bred the imago, have the body colored as the imago, but paler and obscurer. The setæ are obscure pale greenish, less distinctly annulate, and scarcely pilose, except at base. The wings are subopaque, clouded with fuscous; the fuscous cross-veins bordered

with fuscous, and the hind edge of the wings ciliated. The hind wings are paler, and tipped with fuscous.

Length ♂ 5—8 mill.; ♀ 6—8 mill. Alar exp. ♂ 18—20 mill.; ♀ 19—23 mill. Seta ♂ 10—13 mill.; ♀ 8—13 mill. Ant. leg ♂ $6\frac{1}{2}$ mill.; ♀ (same size) 6 mill. Ten ♂, seven ♀.

PALINGENIA TERMINATA, n. sp.—♂ When alive this insect is generally distinguishable from the above by the eyes being yellowish, not pearly whitish. The dried specimen differs as follows: The color is yellowish. The parts which are ferrugino-piceous in *pulchella* (imago), even immediately after moulting, are almost always ferruginous or luteous; the meso- and meta-thoracic scutella are sometimes tipped with white, but rarely entirely white; the lateral dots of the abdomen are always absent; the sternum is almost always immaculate; the medial band on the four posterior femora is generally obsolete; the cross-veins are scarcely coarser than the veins, giving the wings a paler appearance; and generally there is discoverable on the second costal vein the same short streak found in *flavescens*, which is only seen in a single ♂ *pulchella*. Two somewhat immature specimens are almost entirely whitish, except that the vertex is partly ferruginous, and there is a ferruginous cloud on the tip of the abdomen.

The ♀ is scarcely distinguishable from ♀ *pulchella* but by the yellowish color, the absence of the lateral dots of the abdomen, and the frequency of the streak on the second costal vein.

Length ♂ $6\frac{1}{2}$ —8 mill.; ♀ 8— $8\frac{1}{2}$ mill. Alar exp. ♀ 18— $21\frac{1}{2}$ mill.; ♀ 23—25 mill. Seta ♂ 19—22 mill.; ♀ 18—22 mill. Ant. leg ♂ 10 mill.; ♀ (same size) 7 mill. Twelve ♂, five ♀.

The ♂ ♀ subimago differ from ♂ ♀ imago, as in *pulchella*. They are scarcely distinguishable from the subimago of *pulchella*, except by the absence of the lateral abdominal dots.

Length ♂ $6\frac{1}{2}$ —7 mill. ♀ $6\frac{1}{2}$ —8 mill. Alar exp. ♂ 19—20 mill. ♀ $21\frac{1}{2}$ —24 mill. Seta ♂ 12—13 mill. ♀ 15—18 mill. Ant. leg ♂ ♀ (same size) $5\frac{1}{2}$ mill. Two ♂; two ♀.

EPHEMERA.

EPHEMERA DECORA? Walker Catal.—♂ Piceous. Seta of antennæ pale at tip. Sternum a little varied with luteous. Abdomen luteous, each segment with a broad lateral dusky vitta, emarginate on its four sides and confluent at its four angles with the adjoining ones, towards the tip of abdomen almost entirely confluent; venter similarly marked; anal processes and setæ pale obscure greenish, the latter regularly incised with fuscous, and the intermediate one slightly the shortest. Anterior legs pale greenish, the femora, base and tip of tibia and tarsal incisures and tips, fuscous; four hind legs pale greenish, with only the tips of the tarsi fuscous. Wings hyaline; veins and cross-veins moderate, subequal, fuscous; the cross-veins irregularly bordered with fuscous, except on the extreme tip and the posterior margin; on the basal disc of the wing, and transversely from the middle of the costa nearly to the hind margin, these borderings become confluent, so as to exhibit a spot and a semi-fascia, both of them irregular in outline; on the costa they are wider, towards the tip of which there is a pale brownish cloud; the hind wings are lightly tipped with fuscous.

The ♀ has a very high and acute carina, divaricate and extending from the occiput to the orbit of the posterior ocellus; in the ♂ this carina is not so obvious. The sternum is paler. The lateral abdominal vittæ are not nearly confluent from joint 2 to joint 6; and on the venter they are reduced to an abbreviated line.

Length ♂ 10 mill. ♀ 13 mill. Alar exp. ♂ 23—25 mill, ♀ 27 mill. Setæ ♂ 25 mill. ♀ 15 mill. Interm. seta ♂ 20—21 mill. ♀ 13 mill. Ant. leg ♂ 12 mill. ♀ 6 mill. Two ♂, one ♀.

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The ♀ subimago is of a nearly uniform obscure fuscous color, the abdomen with only a trace of the pale colors of the imago. The legs are obscure greenish, immaculate, the front legs a little the darkest. The three setæ are equal, greenish-fuscous and pilose; and the wings slightly tinged with fuscous and ciliate behind.

Length ♀ 10—11 mill. Alar expanse ♀ 24—26 mill. Setæ (3) ♀ 10 mill. Two ♀; ♂ unknown. This is probably *E. simulans* Walk. Cat. I obtained all my specimens in company on the Desplaines River, near Chicago. The imago differs from Dr. Hagen's diagnosis by the thorax not being "luteous" above and the wings not "yellowish-hyaline."

Ephemera flaveola, n. s.—♂ Yellowish. Vertex ferruginous; orbits of ocelli and basal joints of antennæ a little dusky; seta pale. Thorax pale ferruginous. Abdomen with a lateral pale fuscous vitta on joints 3—7 interrupted at the sutures; setæ not quite of equal length, whitish, with the incisures regularly fuscous. Legs yellowish, the anteriors with the terminal half of the femora ferruginous, and the tips of the tibiæ, the first tarsal joint, the incisures of the others and the tarsal tips, fuscous; the hind legs with only the tarsal tips fuscous. Wings hyaline, with a slight yellowish tint on the costa, the veins and cross-veins fine, subequal, hyaline, except the three costal veins and the basal cross-vein which are coarse and yellowish.

The ♀ differs only from the ♂ in the abdomen being egg-yellow wherever it contains eggs; and in the cross-veins of both wings being fuscous, except at the tip and along the posterior margin.

Length ♂ $7\frac{1}{2}$ — $9\frac{1}{2}$ mill. ♀ 9— $10\frac{1}{2}$ mill. Alar exp. ♂ 17—19 mill. ♀ 19—20 mill. Setæ ♂ 20 mill. ♀ 12 mill. Interm. seta ♂ 14 mill. ♀ 10 mill. Ant. leg ♂ $8\frac{1}{2}$ mill. ♀ (same size) 6 mill. Four ♂, three ♀.

The ♂♀ subimago differ from ♂♀ imago only in the setæ being subequal, obscure pale greenish and pilose, and in the wings being subopaque, tinged with dusky, and ciliated behind; in one ♂, but not in ♀, the veins and cross-veins are slightly dusky.

Length ♂ 7—9 mill. ♀ $8\frac{1}{2}$ mill. Alar exp. ♂ 19—20 mill. ♀ 20 mill. Setæ (3) ♂ 9—12 mill. ♀ 12 mill. Two ♂, one ♀.

EPHEMERELLA, new genus (= *Leptophlebia*, Westw.?)

Three long and equal caudal setæ; wings four, hind wings wide with several veins; transverse veins rather numerous, absent, except the basal cross-vein, on the basal two-thirds of the costa of front wing, and the hind margin of both wings, where there are many short, isolated veinlets; eyes ♂ simple, contiguous; ocelli three, nearly transverse, contiguous ♂, somewhat remote ♀. First tarsal joint indistinct, except in anterior ♂ tarsus; more than one-half as long as joint 2, except in anterior ♂ tarsus where it is less than one-fourth as long; joints 2—4 subequal in all the ♂♀ legs, 4 rather the shortest.

Ephemerella excrucians, n. sp.—♂ Yellowish. Eyes in the living insect egg-yellow on their upper three-fourths, pale fuscous on their lower one-fourth; vertex and antennæ ferruginous; seta and orbits of ocelli fuscous. Dorsum of thorax and of abdomen ferruginous, the latter sometimes almost piceous; setæ whitish, with regular fuscous incisures, becoming indistinct at tip. Legs all pale yellow, with the tips of all the tarsi and in the anterior legs the first tarsal joint and the tarsal incisures, cloudy. Wings hyaline, with a slight yellowish tinge on the costa; veins moderate, cross-veins fine except on the costal tip, all hyaline.

The ♀ differs from the ♂ in the veins on the anterior part of the wing being slightly tinged with fuscous.

Length ♂ $5\frac{1}{2}$ — $7\frac{1}{2}$ mill.; ♀ $5\frac{1}{2}$ — $6\frac{1}{2}$ mill. Exp. ♂ $14\frac{1}{2}$ —18 mill.; ♀ 15—19 mill. Setæ ♂ 11—13 mill. ♀ 10— $12\frac{1}{2}$ mill. Ant. leg ♂ 7 mill. ♀ (same size) $4\frac{1}{2}$ mill. Twelve ♂, five ♀.

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The ♂ ♀ subimago differ only in the usual manner from the imago. One ♂, one ♀.

EPHEMERELLA CONSIMILIS, n. s.—♂ Differs from the preceding chiefly in the great elongation and narrowness of the mesothorax, its anterior lobe or præscutum being half as long again as wide, and the whole mesothorax being four or five times as long as wide; whereas in *excrucians* the anterior lobe is scarcely longer than wide, and the whole mesothorax is scarcely three times as long as wide. The sternum is ferruginous, and the legs are immaculate, except the tips of anterior tibia and the first tarsal joint, which are fuscous.

Length ♂ 5 mill. Alar exp. ♂ 14 mill. Seta ♂ about 5 mill. One ♂, which has both the left and the intermediate seta remaining; ♀, unknown.

BÆTISCA. New Genus.

Wings four; front wings with numerous cross-veins; costal cross-veins, except the basal one and those on the terminal one-third of costa, scarcely visible, entirely absent on the middle of the costa; terminal veinlets distinct, not branching from the veins, but partly connected with them by cross-veins. Hind wings wide, with numerous veins, and except towards the tip with numerous cross-veins; tip with many isolated veinlets. Eyes ♂ contiguous, simple. Body very robust; middle piece of prosternum deeply and very widely emarginate behind; anterior mesothoracic lobe not nearly half as long as wide, and transversely truncate; mesothoracic scutell very large, horizontally extended so as to attain the tip of the first abdominal joint. Fifth abdominal joint twice as long as any of the others, which are subequal. Setae three, exterior ones short, middle one rudimental, distinct, exarticulate. Tarsal structure as in *Betis* subgenus B.

BÆTISCA (*BÆTIS*) *OBESA*, Say.—Undescribed imago.—♂ Ferruginous-piceous. Each side of the epistoma with a divergent basal elliptical carina, confluent at its base with the central carina; antennae ferruginous, seta generally pale, sometimes fuscous at base. Sternum paler behind, especially the space between the posterior coxae. Abdomen paler, sometimes quite pale, with the tips of the joints whitish; anal processes pale, sometimes fuscous at tip; setae whitish, with regular fuscous incisures at base, which generally disappear towards the tip; intermediate seta ferruginous, about half a millimeter long. Legs pale greenish-yellow, anterior legs with the knees and the tarsal incisures and tips slightly fuscous; hind legs with only the tarsal tips cloudy. Wings hyaline, the veins fine, except the three costal veins which are rather coarse; the cross-veins so fine as to be invisible to the naked eye except on the costal tip, where they are somewhat coarser, and except also the oblique basal cross-vein, which is particularly coarse; costal veins yellowish, the third vein piceous at its extreme base; a few of the principal veins slightly tinged with fuscous, the rest, as well as the cross-veins, hyaline.

The ♀ only differs from ♂ in the vertex being varied with ferruginous.

Length ♂ 7—8 mill.; ♀ 6—8 mill. Alar exp. ♂ 20—22 mill.; ♀ 22—24 mill. Seta ♂ 6—7 mill.; ♀ 6—7 mill. Ant. leg ♂ 8½ mill.; ♀ (same size,) 4 mill. Twenty ♂, ten ♀.

The subimago, which alone was known to Say, and from which I have obtained the imago, differs from the imago in the colors being darker and obscurer, and in the wings being "dark-brown, with numerous small, transverse, hyaline [spots or abbreviated lines, and a large hyaline,*] very oblique, semifascia about the middle on the anal half." There is also another large, oblique hyaline semifascia at the costal tip, and, as Say adds, the hind wings, except at tip, have numerous transverse, abbreviated, hyaline lines. The setae are obscure green, with fuscous incisures. One specimen, captured a month before

* The words included in brackets [] are omitted in the reprint of Say's Works.

the main brood appeared, has the hyaline part of the wings much extended, their brown color paler, and the setæ pale.

Length ♀ 7—9 mill. Alar. exp. ♀ 22—25. Seta ♀ 4—5 mill. Four ♀; ♂ unknown.

CLOE.

♀♀ *Cloe*. Subgenus A. Wings four, cross-veins rather numerous, 50—60 in number. Hind wings with only two long veins and one short one.

CLOE FERRUGINEA, n. sp.—♂ Ferruginous. Eyes in the living insect double, the superior ones peduncled or contracted at their base, and separated above by a fissure; ocelli peduncled, the two hind ones overhung by the upper eyes, so as to be entirely concealed by the shrunken eye in the dried specimen; antennæ with the two basal joints long, each a little fuscous at tip; setæ whitish at base, fuscous at tip, in one instance *vice versa*. Anterior mesothoracic lobe subtruncate, the corners rounded; sternum pale, generally freckled with reddish-brown. Abdomen densely freckled with reddish-brown, occasionally almost piceous; venter pale reddish-white, not so much freckled; anal processes and setæ whitish. Legs pale-yellowish, with the tips of the tibiæ, the tarsal incisions and tips, and in the anterior legs the first tarsal joint, fuscous. Wings hyaline, a little yellowish on the costa; veins and cross-veins moderate, subequal, hyaline; the costal veins yellowish, and a few of the other veins generally tinged with fuscous; a pair of isolated veinlets between the tips of each pair of veins. Hind wings with numerous cross-veins on the two long veins.

Length ♂ $7\frac{1}{2}$ — $9\frac{1}{2}$ mill. Exp. ♂ 15—18 mill. Seta ♂ 15—17 mill. Five ♂; ♀ unknown.

The subimago, from which I have bred the imago, is darker and obscurer; the setæ scarcely pilose except at base; the wings fumose, the cross-veins whitish-hyaline, and bordered with whitish-hyaline, and the postcosta pale; the costal veins and the base of some of the other veins are fuscous, and the costa is fuscous. Hind wings pale. All four wings with dense and long ciliations behind.

Length ♀ $6\frac{1}{2}$ mill. Alar exp. ♀ $17\frac{1}{2}$ mill. Seta ♀ 9 mill. One ♀; like ♂, bred from. In this species the first tarsal joint is entirely obsolete in the four hind legs, but distinct in the ant. ♂ legs, where it is about a quarter as long as joint two, and also in ant. legs of ♀ subimago, where it is about half as long. In two imagos and one subimago, a very small intermediate seta was visible in the recent insect, which disappears in the dried specimen.

♀♀ *Cloe*. Subgenus B.—Four wings; cross-veins sparse, about 14—18 in number. Hind wings with only two veins.

CLOE FLUCTUANS, n. sp.—♀ Brownish white. Vertex sometimes ferruginous, and with a double longitudinal carina; basal joints of antennæ long; seta dusky, sometimes pale at base. Thorax with a double, light-brown vitta, confluent behind. Abdomen above and below generally brownish-white, sometimes varied with brown; in two specimens pale-brown, with the sixth segment brown above and beneath; seta whitish. Legs whitish, with the tips of tarsi cloudy. Wings hyaline, iridescent; veins rather coarse towards their origin, cross-veins fine; the veins generally brown, and occasionally edged with brown towards their origin, towards the postcosta hyaline; the cross-veins always hyaline; space between the first and second vein of the costa hyaline, with 15—18 small, brown spots on its anterior edge, a few of them confluent; behind the second vein a light brown vitta, containing about fourteen round hyaline spots—some of them confluent before or behind with the hyaline part of the wing—with its posterior edge variable and irregular, sometimes presenting six or seven large obtuse teeth. Isolated veinlets, mostly single. Hind wings, with many cross-veins.

Length ♀ 6—7 mill. Alar exp. ♀ $13\frac{1}{2}$ —17 mill. Seta ♀ $10\frac{1}{2}$ —12 mill. 1862.]

Seven ♀; ♂ unknown. Tarsi as in *ferruginea*. Differs from *C. undata*, Pictet, in the setæ not being annulated, in the costal margin being umber brown, not fuscous, and in there being no fuscous cloud on the disk and posterior margin of the front wing.

CLOE UNICOLOR? Hagen.—♂ Obscure piceous. Eyes shrivelled, but apparently double; seta of antennæ fuscous. Abdominal seta pale, cloudy at tip. Legs all pale yellowish; tips of tarsi cloudy. Wings hyaline, veins moderate, cross-veins fine, the former sometimes slightly dusky, the latter hyaline; isolated veinlets in pairs. In the hind wings the space between the two veins is subopaque, and there are no cross-veins.

On the vertex ♀ there is a longitudinal dilated stria; the abdomen is bright ferruginous, with the incisures in the living insect pale, and a pale, lateral spot on each segment.

Length ♂ $2\frac{1}{2}$ mill.; ♀ 5 mill. Alar exp. ♂ 9 mill.; ♀ 12—13 mill. Seta ♂ 5 mill.; ♀ 6 mill. One ♂, three ♀. The diagnosis of *unicolor*, Hagen, is very brief.

CLOE VICINA? Hagen.—♂ Piceous. Eyes in the living insect, as in *C. ferruginea*, but the lower eye is not attached laterally to the upper eye, as in all other species with double eyes known to me, but at its posterior corner; seta of antennæ fuscous, pale at tip. Joints of abdomen whitish hyaline, with a lateral dot on each, except the four last, which are piceous; venter pale hyaline, the four last joints opaque whitish; setæ whitish, the incisures often fuscous towards the base. Legs pale, except the anterior femur, which is sometimes pale ferruginous; tips of tarsi cloudy. Wings hyaline iridescent; veins moderate, cross-veins very fine, all hyaline; isolated veinlets in pairs. In the hind wings the space between the two veins is subopaque, and there are no cross-veins.

The ♀ differs in the head, thorax, sternum and abdomen being ferruginopiceous, sometimes ferruginous; the venter is reddish white. The anterior femur is always immaculate.

Length ♂ 4—5 mill.; ♀ $3\frac{1}{2}$ — $5\frac{1}{2}$ mill. Alar exp. ♂ 9—11 mill.; ♀ 9—12 mill. Seta ♂ $7\frac{1}{2}$ —10 mill.; ♀ 5—9 mill. Seven ♂, sixteen ♀. Very near *posticata*, Say, but differs in size, and in the wings not being white.

What, I have no doubt, is the subimago of the above, (see below apud *C. dubia*), differs in the colors being obscurer, and the ♂ abdomen dull-whitish-hyaline at base, sometimes obscure greenish. Tarsi sometimes dusky. Wings fumose, the veins rather coarse and dusky, the cross-veins the color of the wing. The cilia are close-set, and about one-half millimetre long. At first sight very like *B. debilis*, subimago.

Length ♂ 3— $3\frac{1}{2}$ mill.; ♀ $3\frac{1}{2}$ mill. Alar exp. ♂ 11 mill.; ♀ $8\frac{1}{2}$ —14 mill. Seta ♂ 5 mill.; ♀ 4 mill. The ♂ ♀ anterior tarsi are short and subequal. Two ♂, three ♀.

♀♀ *Cloe*. Subgenus C.—Two wings; cross veins sparse, about 14—18 in number.

CLOE DUBIA, n. sp.?—Differs from the preceding in size, and in the total absence of hind wings. The lateral abdominal dots ♂ have generally a hyaline centre, and the ♂ eyes are normal.

The ♀ differs from the ♀ of *vicina* in the head, thorax, sternum and abdomen being pale ferruginous, the head and abdomen occasionally obfuscated. The venter is pale yellowish or greenish; and the anterior femora are always more or less ferruginous.

Length ♂ $2\frac{1}{2}$ —4 mill.; ♀ $2\frac{1}{2}$ —3 mill. Alar exp. ♂ 8— $10\frac{1}{2}$ mill.; ♀ 8— $10\frac{1}{2}$ mill. Seta ♂ $4\frac{1}{2}$ — $5\frac{1}{2}$ mill.; ♀ 3— $4\frac{1}{2}$ mill. Nine ♂, fourteen ♀.

The subimago, from which I have bred numerous imagos, differs from the imago precisely as that of the preceding. The dimensions are similar to those of the imago. Nine ♂, ten ♀. As Dr. Hagen has not stated whether his vi-

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cina has any hind wings or not, it is doubtful whether that species be identical with *dubia* or with the preceding.

CLOE MENDAX, n. sp.—♂ Pale ferruginous. Seta of antennæ fuscous, pale at tip. Sternum and venter pale greenish hyaline, the latter opaque at tip. Legs pale, tips of tarsi cloudy. Wings hyaline, veins moderate, cross-veins fine, all hyaline; isolated veinlets all single.

The ♀ has sometimes the thorax tinged with green, and is always paler above.

Length ♂ 4 mill.; ♀ 4—5 mill. Alar exp. ♂ 14 mill.; ♀ 14 mill. Seta ♂ deficient; ♀ 9 mill. One ♂; four ♀

The ♂ subimago differs in being of a uniform very pale ferruginous color. The abdominal seta is pale; and the legs are immaculate. The wings are somewhat opaque, and slightly tinged with dusky, as well as their veins and cross-veins, and the cilia are long and dense. In the living insect the lower eyes are blackish, and the upper eyes pale, and there is no intermediate seta visible.

Length ♂ 4 mill. Alar exp. ♂ 13½ mill. Setæ ♂ 8 mill. One ♂; ♀ unknown. This species differs from all the preceding, except *undata*, in the terminal veinlets being single, and not in pairs. Westwood formed the species having the terminal veinlets in pairs, and hind wings with only two veins, into the genus *Brachyphlebia*, which, however, he does not recognise in his Synopsis. His definition would include *C. vicina* and *C. unicolor*, but not *C. undata*. (Intr. II., p. 25.)

CÆNIS.

CÆNIS HILARIS, Say, (= *amica*, Hagen?)—I possess a single ♂ subimago, which agrees with Dr. Hagen's diagnosis of *amica*, except that the prothorax is not banded with black like the first of his two specimens. Say states that the thoracic bands of his species are also sometimes obsolete. Dr. Hagen suggests that Say's species and his are identical, and it is probably the case, as Say mentions the wings being "ample," and the abdomen being "depressed," which last is an unusual character in Ephemerina, and is conspicuous in my specimen. The basal breadth of the wings is to their length as two to three, and they are finely, but not densely, ciliate, and very slightly tinged with fuscous. The cross-veins are only four or five, very fine and scarcely perceptible, and there are no terminal veinlets.

Length ♂ 3 mill. Alar exp. ♂ 8½ mill. Setæ deficient, except a few joints of each.

ODONATA AGRIONINA.

N. B.—It is well known that in the three tribes of Odonata—Agrionina, *Æschnina* and *Libellulina*, with the exception of the subtribe *Gomphina*, where the colors are generally constant—the ground colors of the body often change much in drying, especially the greens and the blues, though not the yellows; that they differ much in individuals of different degrees of maturity; that they are often quite different in the two sexes, the ♂ frequently affecting blue and the ♀ green,* except in *Agrion Ramburii*, where it is exactly the re-

* In *Anax Junius* the ground color of the abdomen of the living ♂, except the first and a small portion of the second segment which are grass green in both sexes as well as the thorax, is invariably a vivid ultramarine blue; in the living ♀ it is invariably obscure pale purple or lilac. Yet Say describes both sexes, of this very common insect, as of the same color. *Æschna constricta* and *clepsydra* follow invariably the general rule in the color of the abdomen only, ♂ blue, ♀ green, thorax green ♂ ♀. In *Libellulina* I have observed in the following species that when the ♂ first appear they are colored exactly like the ♀, but that they afterwards assume, sometimes over their entire bodies, a milky blue tint, (*bleu saupoudré*), which, as we learn from a memoir by M. Schelver, quoted to me by Dr. Hagen, is occasioned by the secretion of a kind of oil soluble in ether and alcohol:—*Plathemis trimaculata*, *Lib. luctuosa*, *Lib. pulchella*, *Mesothemis longipennis* and *Mes. simplicicollis*. In *Libellulina* this oil, which is occasionally seen in ♀ in small quantities, seems to be secreted under the external integument; in *Agrionina* on its surface, when it is known as *pruinoseness* and may be washed off.

verse; and that in Agrionina, even in the same sex, and at the same stage of maturity, and while the insect is still alive, a very great variation of color is often observable. For example, many adult ♀ of *Agr. Ramburii* occur, that are orange instead of blue. In Agrionina the dark markings also are often variable in the same sex, and differ most wonderfully in the two sexes. On the contrary, the coloring of the legs, as is generally the case in most families of Insecta, is in Agrionina, except in very immature individuals, remarkably constant in the same species, does not, so far as my experience extends, vary in the sexes, and varies very considerably in different species, while on the other hand it does not fade or change materially in drying. It fulfils, therefore, if this be correct, all the conditions of a good specific character. Hence, it has occurred to me, that a little more precision might be advantageously introduced, in this tribe, into the nomenclature of the colorization of the leg, and more particularly the femur. Just as in *Gomphina*, on each side of the dorsum of the thorax there exist three normal dark stripes—the dorsal, the antehumeral and the humeral—each of which has its *locus* definitely ascertained; so in the femur of Agrionina there exist three normal dark vittæ, the *locus* of which is susceptible of being accurately determined. That this is so, any one may convince himself by comparing *Lestes unguiculata*, or some other species which has all the three normal femoral vittæ coexisting, with other species of *Lestes* or *Agrion* which have a smaller number of femoral vittæ. He will find that the difference between them is merely that one or more vittæ are obsolete, and that those vittæ which are not obsolete retain the same invariable *locus*.

Supposing the leg, with the knee slightly bent, to be extended horizontally at right angles to the body, and in such a position that the tibia and femur shall both lie in the same vertical plane, the back of the insect being of course supposed to be uppermost; I call that vitta whose *locus* lies underneath, and does not extend beyond the two lateral rows of spines, which are always in Agrionina present on the inferior surface, "the inferior vitta." This has generally by authors been called "the interior." The vitta whose *locus* lies above, with its two edges equi-distant from the two rows of spines beneath, I call "the superior vitta." And the vitta, whose *locus* is on the anterior side of the femur, betwixt the "inferior" and the "superior," I call "the anterior vitta." Strictly speaking, these are, I believe, all the vittæ which exist on the odonatus femur; and there is no such thing in Nature as a posterior black vitta on the femora of an Odonate. But just as, for convenience sake, M. de Selys sometimes considers the ground-color of the thorax of *Gomphus* to be black, and enumerates its yellow stripes,* which of course changes the *locus* of every stripe, the so-called yellow stripes occupying the intervals between the normal black ones; so it is sometimes convenient, when the inferior, anterior, and superior vittæ are all confluent, leaving only the posterior part of the femur pale, to consider the femur as being black with a posterior pale vitta. Dr. Hagen has remarked, that the true ground-color of the thorax in *Gomphus* is pale, because some species occur with the thorax all pale, and none with the thorax all black; and for this reason he seems to object to M. de Selys's nomenclature. There is a wide difference, however, between these two cases. The imaginary pale vittæ on the thorax of *Gomphus* have a different *locus* from the normal black vittæ; while the imaginary posterior pale vitta on the femur of *Agrion* has precisely the same *locus* as a normal posterior dark vitta would have, supposing such a vitta to be possible.

The "anterior" and "superior" vittæ are confounded together by authors under the name of "exterior;" and sometimes, when there is a pale "posterior" vitta, the femur is said to be "pale below"—thus giving rise to a great deal of confusion between the true "inferior" and the "posterior" vitta. In many species the inferior and the anterior are confluent; and it is very fre-

* See the synoptical tables opposite page 14 of the "Monogr. des Gomphines."

quently the case that the anterior femora possess a confluent inferior and anterior, while the other four femora have merely an inferior. Further variations between different species are caused by the vittæ being abbreviated. As a general rule, in Agrionina, each pair of legs is darker than the pair immediately behind them, when there is any difference; but in *Æschnina* and *Libellulina* the contrary rule seems to prevail. The colorization of the tibiæ and tarsi, as compared with that of the femora, is simple; they have merely an inferior vitta, whose *locus* is rather on the anterior row of spines, and a superior vitta.

Why, if every separate species of *Gomphus* and *Agrion* had been separately created, the great Author of Nature should have thus restricted himself to working upon one pattern only—a phenomenon which has been noticed in many other families of insects, as, for example, in Cincindelidæ, by my friend, Dr. J. L. Le Conte—is to me an insoluble problem. Why do we never find odonates with their legs fasciate, instead of vittate? On Mr. Darwin's theory, the reason becomes at once apparent. In *Macrogomphus? spiniceps* mihi I have recorded a remarkable apparent deviation from the unity of colorization elsewhere observable in the thorax of *Gomphus*; but I am convinced it is only apparent.

Another point in which I have deviated from the nomenclature of *Dr. Hagen* and *M. Selys* is in some of the pieces of the head. The front of the odonatous head—or, as Say calls it, in *æschna* and *libellula*, “the frontal vesicle,” as distinguished from “the vertical vesicle”—is divided into two subequal parts by a transverse suture or stria, below which comes another shorter and generally curvilinear transverse suture, which separates what agreeably to the analogy of other orders I call the epistoma, it being the piece immediately overlying the labrum, with which it is connected by a more or less membranous suture. The authors of the *Monographie* call this last piece “the rhinarium,” and the lower part of what I consider to be the front they call “the nasus,” or sometimes “the epistoma,” confining the term “front” to that part of Say's “frontal vesicle” which lies above their “nasus.” I am by no means certain but what their “nasus” and “rhinarium,” taken together, are the analogues of what in other orders is called the epistoma; but their “nasus” by itself can scarcely be so.

CALOPTERYX MACULATA, Beauvois. (North and South Illinois.)

HETERINA RUPINSULENSIS, n. sp.—♂ Black, with a slight brassy tinge. Head hairy, pale brown in front of a transverse line passing behind the base of the antennæ; labrum with a lateral black tubercle; mandibles and the tip of the labium brown-black; all beneath pale-brown; post-occipital tubercles prominent, acute; antennæ with their first and second joints pale brown; and the third, which is longer than the first and second put together, black; the seta, which is shorter than the third joint, black. Thorax hairy; prothorax with a large triangular posterior lobe; dorsum of thorax with a brown lateral stripe, becoming much wider inside on its terminal half; pleura pale brown, the anterior half of its anterior segment with an abbreviated black stripe pointed above, the posterior half with a rather narrower one, abbreviated above and below, not attaining the spiracle which is black; a short black line above in the suture between the two segments; the posterior segment with a much abbreviated black stripe, the narrowest of the three; sternum pale brown. Abdomen with an obscure yellowish lateral stripe, fading out at the end of the third segment; joints 1—2 hairy, the two or three terminal joints pubescent under the lens; joint 2 brown on its basal two-thirds; 2—7 with an obscure yellowish basal annulus, more obvious on 3—5; a carina on the tip of joint 10, terminating in a spine, with a small spine on each side; joints 8—10 each one-third shorter than the preceding joint; venter black, with a polished longitudinal tubercle on the tip of the last segment, immediately behind the insertion of each lower appendage. Superior ap-
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pendages black, pubescent under the lens, as long as the penultimate abdominal joint, regularly curved inwards and downwards from their middle, robust, with no tubercle above at their base, obtuse at their tips, with a broad lamina beneath, semiovally emarginate in its middle, which commences in an oblique truncation at their base and terminates in a square truncation at three quarters of the distance to their tips, the tip of the lamina being as wide as any part of it; about five small acute spines outside opposite the tip of the lamina; no appearance of any pencil of hairs at the base of the lamina, other than the general pubescence of the whole appendage. Inferior appendages, about one-third the length of the superiors, black, slender, cylindrical, with a basal enlargement, curving inwards and upwards so as to touch at their tips, truncate at tip, and attaining the middle of the lamina of the superior ones. Legs black, trochanters and coxæ pale brown; femora brown inferiorly and posteriorly; tibiæ on their basal half brown, except inferiorly. Wings hyaline, not glittering; pterostigma small, pale brown, twice as long as wide, surmounting one and three-quarters cells before, one and a half cells behind; anterior wings with a pale brown, semi-transparent, basal spot, commencing abruptly on the posterior edge of the median space, not extending beyond the arc, except very obscurely along the median space, and gradually fading away on the longitudinal centre of the basal space; posterior wings with a similar spot commencing similarly, extending about two cross-veins beyond the arc with an obscure narrow prolongation along the median vein, and fading away gradually between the costal and sub-costal veins; at their extreme tip a very faint brown cloud, scarcely perceptible; veins and cross-veins of all four wings black, except those in the region covered by the basal spots, and the median vein nearly as far as the nodus, which are pale brown; all the brown cross-veins behind the median vein in both wings distinctly but narrowly bordered with sub-hyaline. Anterior wing with antecubitals 23—24, postcubitals 31. Posterior wing with antecubitals 22—23, postcubitals 28—30.

Length of body ♂ 48 mill. Alar exp. ♂ 59 mill. Length abdomen ♂ 38 mill.; medial breadth $\frac{2}{3}$ mill. Length of superior pterostigma nearly 1 mill.; of inferior $\frac{2}{3}$ mill. The quadrangle has 4—6 cross-veins; the basal space 4—5. The postcostal space of the anterior wing has at least three irregular ranks of cells, except at its base. Described from one very mature ♂; ♀ unknown.

Of the twenty-seven described species of *Heterina*, not a single one, except when quite immature, has, like this species, the basal spot of the ♂ anterior wings, other than some shade of sanguineous. Several of them have the basal spot of the ♂ posterior wings brown (*sanguinea*, *rosea*, *mortua*, *macropus* and *tricolor*); and eight others have it either reddish brown or some mixed color (*hebe*, *auripennis*, *caja*, *carnifex*, *proxima*, *simplex* (mature), *cruentata* and *læsa*). It is stated, as one of the characters of the subgenus *Heterina*, that all the four wings of the ♂ have a red basal spot. (*Monographie des Calopterygines*, p. 97.) Now that a species has occurred with no red basal spot at all on any of its wings, it will probably be necessary to modify the subgeneric definition.

Another point in which our insect differs from all other known *Heterinæ*, is that the basal spot of the anterior ♂ wing starts from the postcostal vein, leaving the entire postcostal space hyaline. In all the twenty-seven described species, this spot, for at least half its length, touches the posterior margin; and in *carnifex*, *proxima*, *cruentata*, *vulnerata*, *moribunda* and *occisa* it touches it for its entire length.

There is a remarkable similarity between *rupinsulensis* and *tricolor*,—a rare species which occurs in the United States,—but they are sufficiently distinguished, not only by the above points, but by *tricolor* being slightly more robust than *Americana*, whereas, *rupinsulensis* is decidedly slenderer on placing the two side by side; by the superior ♂ anal appendages of *rupinsulensis* being unlike those of *tricolor*, as figured and described in the "Monographie Calopt.,"

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(plate xii. fig. 5,) while they bear a striking resemblance to those of *sanguinea*,—a South American species, (figured plate x. fig. 6.)—and, besides several minor points of difference, by the cross-veins in the basal spots being bordered with subhyaline,—a peculiarity which is not noticed as occurring in any other species. No *Heterina* has hitherto, according to Dr. Hagen, been found in a higher latitude, either North or South, than 40°. Rock Island lies in about 41° 30'.

LESTES RECTANGULARIS, Say! L. UNGICULATA, Hagen! L. HAMATA, Hagen. L. FORCIPATA, Rambur.

LESTES EURINA? Say.—[Unknown to Dr. Hagen.]—♂ Dark metallic green. Head brown black, varied anteriorly with brown; epistoma obscure greenish; labrum obscure greenish on its terminal margin, dusky at base, except a small obscure greenish triangle on its posterior margin; tips of mandibles brown black; beneath pale greenish. Dorsum of thorax rather pale brown, with a fuscous, sublateral, slightly abbreviated vitta; pleura deep bright yellow, the anterior segment with a wide brown stripe in front, sending off a narrow branch behind and below to the intermediate coxæ, and widened behind and above by two successive sudden dilatations so as to cover the entire width of the segment beneath the wings; the posterior segment with a large inferior brown, elongate-triangular spot, its upper side parallel with the wings, and its apex reaching the back of the posterior coxæ; sternum pale. Abdomen with a blue reflection on joints 2—4, the base and sides of joint 1, and sides of 2, yellowish, 2—7 with a narrow yellowish basal band, interrupted above and widening below, subobsolete in 6—7; joint 10 triangularly emarginate above at tip, the sides of the emargination carinate, yellowish beneath, and with an obscure yellowish lateral basal triangle; the tips of segments 1—8 black, more obviously so beneath, and especially towards the tip of the abdomen. Superior appendages piceous, nearly as long as the penultimate joint of the abdomen, with their tips a little dilated and rounded, regularly curved from their middle inwards and downwards, with ten or twelve small spines on their exterior middle, a long acute spine pointing backwards on their internal base, and on their internal middle a short broad tooth, truncate, with four very small spines on it. Inferior appendages short, yellowish, about one-third the length of the superiors, conical, obtuse, directed obliquely upwards and slightly curved inwards at tip. Legs black, coxæ and trochanters pale, anterior femora with a short basal inferior and superior yellowish vitta, both of which become wider and longer on the intermediate and still more so on the posterior femora; tibiæ all with an anterior yellowish vitta. Wings uniformly flavescent, no darker on costa; veins and cross-veins black; pterostigma brown, surmounting four cells before, three and a half behind. Postcubitals 15—16.

Length ♂ 50 mill. Alar expanse ♂ 64 mill. Length of abdomen ♂ 41 mill. Pterostigma 2½ mill. One ♂ specimen, somewhat immature; ♀ unknown.

There is no other described species of North American *Lestes* which has the wings entirely flavescent, and on this account, and because the coloration of the legs and the structure of the anal appendages agree with Say's brief description, it may probably be the true *Eurina*, Say, though he describes the dorsum of the thorax as having "a yellow vitta, behind bifid and divaricated." The markings of the thorax are so variable in *Agrionina* that, by themselves, they cannot be depended on to separate two species otherwise alike.

LESTES INÆQUALIS, n. sp.—♂ Dark metallic green. Head with the region of the ocelli almost black; epistoma pale brown; tips of the labrum and of the mandibles brown black; the rest of the mouth and all beneath yellowish; antennæ black, first and second joints yellowish at tip. Dorsum of thorax livid black, with a slight greenish reflection; a medial and lateral yellowish line; pleura yellowish, with a broad, livid black stripe in front, widened under
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the wings; sternum yellowish. Abdomen towards the base with a bluish reflection; the basal half of joint 1 and a narrow interrupted basal band on 2 to about 6, and also on 10, yellowish; a lateral yellowish vitta obsolete from the middle of joint 5 to the tip of joint 8; joint 10 deeply emarginate at tip, and with a yellowish terminal band. Superior appendages a little longer than the last abdominal joint, regularly tapering to their tips inside and outside, curved from their middle inwards and downwards, yellowish at base, brown-black at tip, with seven or eight small black spines externally towards their tip; at their internal base is an acute spine pointing backwards, immediately behind which is a narrow but deep emargination, followed by a fine serration and a very small obtuse tooth, the tooth placed at two-thirds the distance to their tip. Inferior appendages extending one-third of a millimetre beyond the superiors, yellowish and of a flattened conical shape at base, brown-black, slender and cylindrical at tip, straight till they attain the tips of the superiors, when they suddenly curve inwards and upwards, their tips obtuse and approximate; their internal edge, at about one-fourth the distance to their tips, is suddenly contracted, making a conspicuous rectangular tooth. Legs yellowish, femora with an inferior, anterior and superior black vitta; tibiae with an inferior black vitta, on the anterior tibiae an anterior one also confluent with the inferior; tarsi black. Wings hyaline; veins and cross-veins black; pterostigma pale brown, surmounting $2\frac{1}{2}$ —3 cells. Postcubitals 16.

The ♀ differs from ♂ only in the lateral abdominal vitta being uninterrupted, and in the two last abdominal joints being varied with yellowish, the penultimate containing two small, round, discal spots, transversely placed. The superior ♀ appendages are elongate-conical and acute, three-quarters the length of the last abdominal joint; the inferiors a little shorter, conical, obtuse and directed upwards; and the vulvar laminae are externally serrate under the lens. Postcubitals 15.

Length ♂ 52 mill.; ♀ 51 mill. Alar expanse ♂ 60 mill.; ♀ 62 mill. Abd. ♂ 42 mill.; ♀ 40 mill. Pterostigma ♂ ♀ 2 mill. Differs from all described North American species in the great length of the inferior ♂ appendages, and from all but *grandis* and *Eurima*? in having 15—16 postcubitals. It agrees with *forcipata*, Rambur, in having three distinct femoral vittae.

AGRION IRENE, Hagen. A. RAMBURII, Selys. A. EXSULANS, Hagen, (R. I. and Chicago.) A. PUTRIDUM, Hagen. A. APICALE, Say, (= *immundum*, Hagen.) A. CIVILE, Hagen.

AGRION ———, Hagen MSS., n. sp.—♂ Black, with a slight brassy tinge. Head and thorax villous. Head with two transversely elongated occipital spots, a broad band between the antennae, the epistoma, and also the labrum, all obscure greenish; all below pale greenish. Posterior margin of prothorax rounded; dorsum of the thorax with a broad sublateral blue or obscure greenish stripe; pleura with a short black median line above, between the wings, sometimes dull blue sometimes obscure green, with a strong metallic reflection so as to exhibit, in certain lights, the appearance of a broad yellow stripe before and behind; sternum pale, more or less pruinose. Abdomen vivid blue in the mature living insect, pale greenish brown in immature specimens; on joint 1 a basal quadrangular black spot; on joints 2—7 an obhastiform terminal black spot, one millimetre long in 2—5, covering two-thirds of the length in 6 and the entire length in 7; joint 10 widely emarginate at tip, and with a quadrangular laterally emarginate black spot covering its upper surface. Superior appendages robust, short, black, polished, incurved and truncate at tip when viewed from above; when viewed in profile tapering and curved upwards, and with a small pale tubercle attached inside to the base of each. Inferior appendages pale at base, black at tip, slender, acute, a little longer than the superiors, sometimes with a terminal unguiculus. Legs pale, femora and tibiae with an anterior black vitta; tarsi with their tips and incisures black. Wings hyaline, pterostigma black, or when immature pale brown. Postcubitals 9—11.

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The ♀ differs from the ♂ in the thorax being always marked with obscure green, not blue, the pleura exhibiting the same reflections as in one ♂; in the abdomen being more robust and of an obscure green, not blue; and in the obhastiform spots on joints 2—7 being of a decided metallic green and covering the full length of every joint, the acute tip of each spot being partly truncate; joints 8—9 are black above, except a narrow basal line. The pterostigma also is pale-brown, not black. The appendages are pale, short and conical, the superiors rather the longest, the inferiors directed upwards; and there is a long acute spine at the tip of the eighth ventral segment. The whole body beneath, including the legs, is more or less pruinose. Postcubitals 10—11.

Length ♂ 29—30 mill. ♀ 27 mill. Alar expanse ♂ 34—35 mill. ♀ 34 mill. Two ♂, one ♀; one pair taken *in coitu*. Specimens of this insect were sent by me in 1860 to Dr. Hagen, who pronounced it a new species, and will probably name it in his forthcoming Appendix to the Synopsis. It scarcely differs from *Agr. Doubledayi*, Selys, except in the apex of the superior ♂ appendages being not excised. The style of ornamentation is precisely that of *Agr. civile*, and varies similarly in ♂ ♀. It is our commonest species at Rock Island, except perhaps *Agr. Ramburii*.

AGRION BINOTATUM. n. s.—♂ Brassy black. Head and thorax villous. Front pale reddish brown, reddish brown, or in the living mature insect purple, fading to reddish brown in death; transverse stria of front except laterally, a transverse line before the anterior ocellus, and another divaricating from the base of the antenna to a point before and behind the posterior ocellus, black; antennæ black, their basal joint the color of the front; all behind the ocelli, as well as the region of the ocelli, black, the occiput with a transverse line, and on each side with a triangular brown spot, both of them subobsolete. Posterior prothoracic lobe rounded; dorsum of thorax colored as the front, with a narrow dorsal black stripe; pleura reddish white, often pruinose, with a broad humeral stripe generally enclosing above a pale spot or short stripe, a a short line under the front wing, and a long narrow stripe in the medial suture, stouter above, all black. Abdomen with a yellowish dorsal line on joint 1—4, shorter and narrower in each successive joint; joints 1—4 or 1—6 laterally yellowish, more indistinctly in each successive joint; a conspicuous yellowish basal annulus on joints 3—6, less obvious on 7; joints 9 and 10 blue, except on the lateral margin, 9 with a black medial dot on each side the dorsum; joint 10 triangularly emarginate at tip, with a pale tubercle under each salient angle; venter black. Abdominal appendages black; the superiors short, moderately robust, somewhat tapering, with a large, robust, glabrous tubercle nearly as long as the appendage on their lower inside corner; the inferiors longer, vertically very wide, not tapering, widely emarginate and terminating in two obtuse divaricate teeth, the lower one shorter. Legs black; tibiæ superiorly yellowish. Wings subfumose; pterostigma brown, paler on its margins. Postcubitals 13—17.

The ♀ differs in the coloring being paler, and the markings of the hind part of the head distinct; the spot or stripe enclosed by the humeral black vitta is larger, and often confluent with the pale color behind; the sides of abdominal joints 1—4 or 1—6 are more distinctly yellowish, and joint 9 is only blue at tip, sometimes also with a dorsal and lateral blue spot; no ventral spine. The femora are luteous, blackish only superiorly and towards their tips, and the tibiæ are entirely yellowish, blackish only on their inferior base. Postcubitals 15—18.

Length ♂ 36—38 mill. ♀ 35—37 mill. Expanse ♂ 45—49 mill. ♀ 49—51 mill. Four ♂, five ♀. Occurs on and near Wisconsin log-rafts. Very near *Agr. fumipenne*, Rambur, but differs in the ♂ femora being entirely black, and the abdominal joints 9 and 10 ♂ ♀ partly blue, and also in the shape of the superior ♂ anal appendages. Is related also to the Mexican species *Agr. calidum*, Hagen and *Agr. cupreum*, Hagen.

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ODONATA (ÆSCHNINA.)

[H]ERPETO~~GOMPHUS~~? *RUPINSULENSIS*, n. s.—♂ Greenish yellow. Head with the vertical vesicle yellow behind, black in front, cariniform, transverse, scarcely emarginate, slightly recurved, rounded off at the ends, not abbreviated; all between this and the front black, except the region of the antennæ, which is a little varied with brown; antennæ black, first joint yellowish at tip; labrum with a fuscous basal dot on each side; tips of mandibles brown; central lobe of labium pale livid blue, black on the terminal margin, the lateral lobes pale; occiput straight, scarcely elevated in the middle, densely ciliated with long black hairs. Dorsum of the thorax with its medial carina brown-black at the first commencement of its bifurcation for one-third of a millimetre, also towards the point where its two branches join the base of the anterior wings; an abbreviated pale brown line in the humeral suture above; pleura with the spiracle edged with brown-black; otherwise the entire thorax is immaculate above and below. Abdomen pale brown, clouded with brown, especially behind the medial suture of the segments, which is brown and glabrous, and with the extreme edges of all the segments brown; earlets of the second segment yellowish, externally margined with pale brown; joint 1 mostly greenish yellow; a basal, glabrous, brown annulus on joints 3—7, with indications of a basal lanceolate pale brown spot, suddenly contracted behind its middle and surrounded by brown shading, on the dorsum of 2—9, tolerably distinct in 7, in 8 becoming very obvious; 8 and 9 laterally as much dilated as in *Gomphus fraternus*, and on the lateral submargin almost greenish yellow; joints 8—10 each about one-third shorter than the preceding; venter pale yellowish green. Abdominal appendages all greenish yellow, with long dense pale hairs; the superiors longer than the 10th but shorter than the 9th abdominal joint, directed rather downwards, very robust, approximate at base, distant at tip about one-half millimetre; viewed from above they are convex outside, concave inside, tapering gradually, and obtuse at tip; viewed laterally, they have an inferior carina, and their tip is squarely truncate, and on their terminal half below are about three irregular rows of small short black teeth; the inferiors touch the superiors at base and are scarcely shorter than they are, exactly attaining the lower angle of their truncated tips; viewed from below they are almost cylindrical, very robust, and much rounded at tip; viewed laterally their inferior edge is slightly curved upwards, and their upper edge is semicircularly emarginate for two-thirds the distance from their base, the other third part being obliquely truncate so as to be almost parallel with the lower edge of the upper appendage; on the base of each lower appendage beneath and covering it for one-third its length is a quadrangular anal process, carinate behind on its three margins, the two processes divaricate and connate at their base. Legs pale yellowish green; the trochanters brown beneath, anteriors very slightly, intermediates and posteriors notably; anterior femora with a broad anterior brown vitta, the four posterior femora much marked with brown beneath, but anteriorly with only a short terminal vitta; tibiæ all with a wide inferior black vitta; anterior and intermediate tarsi black, posterior tarsi black beneath, but above with only their tips and incisures widely black. Wings hyaline, slightly flavescent at base; veins and cross-veins black, except the costal vein which is greenish-yellow anteriorly till a little after it attains the pterostigma; pterostigma pale brown, its internal cross-vein prolonged as usual, surmounting $4\frac{1}{2}$ —5 cells; membranule small, cinereous, in the posterior wings only extending half way to the anal angle, which is acute and normal. Antecubitals 13—14; postcubitals 9—10. Two discoidal areolets, commencing with two in the front, with three in the hind wings.

Length ♂ 54 mill. Alar expanse ♂ 68 mill. Pterostigma super. 3 mill. infer $3\frac{1}{2}$ mill. One ♂; ♀ unknown.

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This species cannot, with perfect propriety, be arranged under any of the subgenera of the great genus *Gomphus*, established in the *Monographie des Gomphines*. All these subgenera, except *Erpetogomphus*, have the thorax yellow with black stripes, or dark with subobsolete yellow stripes, and that subgenus disagrees with our insect in the vesicle of the vertex being "divided into two tubercles," in "the ♂ 10th abdominal segment being equal to the 9th," and in "the 8th and 9th segments being but little dilated." (*Monogr.*, p. 69.) The posterior femora in *rupinsulensis* are short, with subequal spines about two-thirds millimetre long for their entire length. Its complete measurement will be found, some pages below, at the end of the genus *Gomphus*. By relaxing my unique specimen I have ascertained the interesting facts, that it agrees with *Erpetogomphus* in having no tooth on the second joint of the penis, and that the first genital hooklet (*hamecon*) is two-branched, precisely in the same extraordinary manner as in *Erpetogomphus cophias*. (See *Mon. Gomph.*, Plate IV, Fig. 6.)

One of two things, therefore, must necessarily be done. Either a new subgenus must be founded to receive *rupinsulensis*, or the old subgenus *Erpetogomphus* must be modified so as to comprehend it. Which of the two courses is adopted is a matter of opinion and taste. For my own part I would suggest that *Erpetogomphus* be modified so as to run somewhat as follows: "Last abdominal segment not notably shorter than the penultimate; abdominal appendages with their branches contiguous; the superiors about as long as or a little longer than the last abdominal segment. [In *Erp. designatus* they are considerably longer.] No tooth on the second joint of the penis. Legs short. Posterior legs not extending beyond the middle of the third abdominal segment. Thorax with the normal dark stripes more or less obsolete. Abdomen with dorsal lanceolate spots, sometimes subobsolete." If a great number of species should hereafter be discovered, groups founded upon variations in the coloring may be established, as in the subgenus *Gomphus*.

So far as can be seen, from the very brief diagnosis of a novel Mexican species, *Erpetogomphus boa*, published by M. Selys de Longchamps, in the *Additions au Synopsis des Gomphines* (p. 11), there is considerable similarity between that species and *rupinsulensis*. They differ, however, not only, as is to be presumed, in the subgeneric characters noted above, but in *boa* having the tibiæ entirely brown, and the inferior appendages only two-thirds the length of the superiors. Moreover the abdomen of *boa* is proportionally much shorter, being to the inferior wing as thirty-nine to thirty-five, whereas in our species it is as thirty-eight to thirty-one. No true *Erpetogomphus* has as yet been discovered north of Texas, and all the known species are American.

MACROGOMPHUS? SPINICEPS, n. sp.—♀ Pale obscure brownish. Head with the occiput straight, ciliated with black hairs as long as usual; its upper edge slightly bent forwards in the middle; the vesicle of the vertex cariniform, curving backwards in an exact semicircle, the sides of which are laminiform and much elevated, and the middle and the posterior extremities much depressed, the latter not attaining the eyes; between each of these extremities and the eye is a slender acute black thorn, as long as the second joint of the antennæ; antennæ black; front projecting less than is usual in *Gomphus*, and excised less than usual, its angulation about quadrangular, and not in an acute angle as in *Gomphus fraternus* Say, the apex of the angle not rounded off; the basal half of its upper surface is pale brown, glabrous, polished; the other half yellow, opaque, with black hairs; its anterior surface is pale brown, semi-transparent, immaculate; mandibles brown at tip; the rest of the mouth pale brown above, yellowish with long rufous hairs beneath. Prothorax largely and obscurely varied with brown; dorsum of the thorax entirely brown, except a faint pale brown, much abbreviated, oblique line on each side of the central carina, indicating the place where the dorsal stripe has almost
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united with the antehumeral; dorsal carina brown-black on its extreme upper edge; covering each side of the dorsum, and parallel with that prolongation of the dorsal carina which runs to the base of the anterior wings, are four equidistant brown-black lines, attaining the suture below, but not quite attaining the carina above, where they are connected each with the adjoining one by a semi-circular brown-black line with its convexity upwards, the middle semi-circle appendiculate above; on the left side of the dorsum the third line is bifurcate at half its length, and the fourth line is obsolete; most of these lines are visible to the naked eye, and under the lens they are all very plain, and they convey the impression of being located, not on the exterior surface, but in the interior crust of the thoracic integument; pleura shaded with brownish immediately behind the humeral suture and under the wings, but with no indication of any stripes; spiracle deep black; the rest of the pleura, as well as the sternum, immaculate; antecular and interalar sinus brown, the two scutella, with a small round piece before them and a piece on each side of them, yellowish. Abdomen long, slender, not expanded at tip, brown-black, its dorsum marked with yellowish as follows: Joint 1 with a round basal spot confluent with a terminal band; joint 2, which has its earlets yellowish and subobsolete, pale brown before its medial suture, behind which is a lanceolate spot reaching the tip; 3—7 with a small, obscure, basal triangle, more and more obsolete behind, till in 7 it is scarcely perceptible; 9 and 10 with a basal transverse line, visible only above, which, as in some of the following species, is in reality a membranous prolongation of the preceding joint; laterally 1—2 and 8—9 are yellowish; 9, which is nearly half as long again as 8, and five or six times as long as 10, being more conspicuously yellow; 3—4 have an obscure basal yellowish triangle, with indications of yellowish markings on the succeeding joints; joint 10 is entirely pale brown both dorsally and laterally, except the membranous basal line. Joint 8 is a little dilated towards its tip, as compared with the preceding joints, but 9 is actually much narrower than the other joints at tip, and no wider than they are at base. Abdominal appendages one and a half millimetres long, brown-black, conical, slender, acute, wide apart at base, directed downwards, slightly convergent, paler beneath, pubescent under the lens, surmounting a pale brown semicircular anal process, which is two-fifths their length and is directed downwards. The vulvar lamina is entirely concealed by the sides of abdominal joint 9, but on relaxing the specimen it is found that the entire ventral pipe is apparently truncate a little before the tip of the 8th abdominal joint, leaving the 9th abdominal and ventral joints in reality perfectly approximate, except at their extreme tip—where they, as well as the entire 10th ventral and abdominal joints, are normal—and exposing an enormous vulvar orifice under the tip of the 8th ventral. The vulvar lamina is reduced to a very small and somewhat obscure transverse, short, obsemi-oval piece, forming a prolongation of the lower side of the 8th ventral, to the posterior edge of which piece is attached a smaller, transverse, short, semi-oval piece, slit for its entire length. The average width of the 9th ventral is about three-quarter millimetre, and the anal passage is marked by a dark vitta. By this extraordinary arrangement, as will be observed, almost the whole of the 9th abdominal is converted into a lateral lamina, although externally no such phenomenon is apparent. Legs pale brown; femora shading into brown at their tips, especially anteriorly; tibiae and tarsi brown-black. Wings hyaline, slightly flavescent at base, especially the anteriors; membranule slender and pale dusky; veins and cross-veins, including the costal, all black; pterostigma very long, yellowish brown, surrounded as usual by coarse black veins, surmounting 6—7 cellules, the prolonging vein of its inner side thicker than the adjoining cross-veins, but a very little dislocated in every wing, and also forming an angle of about 170°*

* I observe this peculiarity also in *Gomphus fluvialis* and *annicola* mihi, but not in my other four species.

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with the inner edge of the pterostigma, and exhibiting a tendency to run parallel with the adjoining cross-veins. Antecubitals 14—15; postcubitals 12—13. Two discoidal areolets, commencing with 2 before, with 3 behind.

Length ♀, 62 mill. Alar exp. ♀, 81 mill. Abdomen ♀, 45 mill. One mature ♀, ♂ unknown.

Besides the somewhat smaller number of antecubitals (14—15, instead of 16—19), the species varies from the characters of *Macrogomphus* only in the 5th antecubital cross-vein being robust, instead of the 7th, the membranule being rather pale dusky than black, the absence of a protuberance on the middle of the occiput, in having only a single subobsolete pale dorsal stripe on the dorsum of the thorax instead of two, and no stripes at all on the pleura instead of two yellow ones, in the abdomen being scarcely annulate with yellow—in which respect it agrees with *parallelogramma* and differs from *annulatus*, the unique specimen of *robustus* having lost its abdomen—and in the femora being normally dilated, and not merely dilated towards their tips. All the femora, as in *Macrogomphus*, are armed with irregular short teeth beneath, not disposed in rows, and the posterior ones are armed on each side towards their tips with a regular row of spines, as usual in ♀ *Gomphus*, and as is said to be the case in *M. annulatus*. The posterior tarsi are about four-fifths the tibiae, the others about three-fifths. It is scarcely necessary, I hope, to add, that the triangles of the wings are all free from cross-veins.

From the most exact measurements I am able to make, abdominal joints 6—10 are respectively $5\frac{1}{2}$, $4\frac{2}{3}$, $3\frac{2}{3}$, $5\frac{1}{3}$ and 1 millimetres long, 3—6 being the same length, so far as the eye can judge.

There is the same disproportionate elongation of the 9th joint in *Macrogomphus*, which, as is remarked in the *Monographie* (p. 94), “is a unique fact among the Odonata.” In that subgenus joints 3—6 are equal, 7 is a little shorter, 8 is only half as long as 9, 9 is longer than even any one of 3—6, and 10 is scarcely one-sixth of 9. (*Mon.*, p. 87.) Again, of the three Asiatic species at present placed in that subgenus, two only are known in ♀, and in both these two special mention is made of the ♀ vertical vesicle being curved as in our species, and having a small tooth at its extremities, just as is the case in *spiniceps*. (*Macr. parallelogramma* ♀, *Mon.*, p. 80, and compare Plate V, Fig. 5; *Macr. annulatus* ♀, *Mon.*, p. 92.) The front, too, in all three species is said to be obtusely angulated, and but slightly projected; and in *annulatus* the long 9th abdominal joint is described and figured as being tapered at the tip precisely as in *spiniceps*, and is said to be “excavated” beneath, probably just as in our species. Other striking points of resemblance are, the costal not being yellow, the imperfect prolongation of the internal side of the pterostigma, the extreme length of the pterostigma, the large number of antecubitals, and the shortness of the posterior legs, which in *Macrogomphus* are said to attain only the middle of the third abdominal joint, just as is the case in *spiniceps* mihi. Although *Macrogomphus* has hitherto only occurred in Java and Hindostan, and although, as has been already seen, there are several minor characters in the circumscription of that subgenus—chiefly, however, characters drawn from colorization—which do not at all suit *spiniceps*, yet, I think, we can scarcely avoid considering this species as a *Macrogomphus*, or at all events as the American analogue of that most remarkable Asiatic form. The full measurements, which will be found a few pages below, along with those of the ♀ of two Asiatic species, agree closely with those two species, except in the length of the posterior femur, where, I suspect, some error has crept into the figures of the *Monographie*. It will be satisfactory if, on the discovery of the ♂ *spiniceps*, its abdominal appendages should be found to be like those of ♂ *Macrogomphus*.

GOMPHUS SPINOSUS, Selys. (Des Plaines river, near Chicago; not hitherto found north of Georgia.) G. FRATERNUS, Say!

GOMPHUS VASTUS, Hagen MS. ! n. sp.—♂ Greenish yellow. Head with the 1862.]

upper edge of the occiput straight, narrowly bordered with black, and ciliate with long black hairs, its lateral margins behind generally black; vesicle of vertex loftily cariniform or laminiform, black, slightly abbreviated, a little emarginate, almost truncate at its extremities; region of the ocelli and vertex black; antennæ black; basal half of the superior surface of the front black; a broad medial black band on its anterior surface, straight above, below generally extending in two waves to the transverse striæ on its anterior submargin, which are unusually deep; epistoma blackish; labrum margined anteriorly and sometimes laterally with black, and with a wide basal black triangle, which is sometimes confluent with the black anterior margin; tips of mandibles, central lobe of labium, and interior margin of its lateral lobes, all black; back of the head black, with two separate and distinct yellow spots behind the eyes on each side. Prothorax black, with the middle of its anterior edge, one small transverse double spot on its disk, one larger lateral round spot, and one short oblique line immediately above the coxæ, all greenish yellow; dorsum of thorax with a double medial black stripe, almost always widened in front, not attaining the anterior margin by one-half to two-thirds millimetre; the dorsal carina yellow, except a small spot in front which is black, and all behind its posterior furcation, which is black and narrowly margined with black; the antecubital sinus black in front; a wide antehumeral black stripe abbreviated above, and a humeral black stripe on the suture never confluent above with the antehumeral; pleura with a black oblique line, sometimes interrupted towards its upper end, just before the spiracle which is black, and a narrower line in the suture behind the spiracle, which last line is occasionally subobsolete; sternum pale greenish, sometimes varied with dusky, often with a large obscure dusky spot behind the posterior coxæ. Abdomen black, expanded to an unusual width on segments 7—9, its dorsum marked with greenish yellow as follows: Joint 1 with a large terminal obtriangular spot extending to its base; 2 with a broad vitta, generally bi-emarginate laterally; 3—7 with a narrow basal line tapering to a point behind, slightly or not at all abbreviated in 3, more and more abbreviated towards 7, where it reaches to only two-fifths of the joint, and is a little wider than in any of the other joints; earlets on joint 2 yellow, anteriorly black, posteriorly with many minute black teeth; laterally joints 1, 2 and 9 are yellow, except the posterior edge of 2; 3—7 with a basal yellow triangle, extending to the inferior margin; 8 with a transverse basal yellow line on the dorsum, sometimes invisible, which is in reality a membranous prolongation of 7, and also with a large, quadrangular, basal, yellow spot, one-third or one-fourth as long as the joint, which never attains the inferior margin of the segment, though it always attains the basal angle; venter fuscous, sometimes mottled with yellow. Abdominal appendages black; the superiors wide apart at base, twice as long as the last abdominal joint, which is one-quarter the length of the penultimate joint, slender, conical, strongly divaricate, regularly curved downwards for three-fourths their length, when they suddenly curve upwards and taper to a very fine, long, acute point; below at the change in the curvature is a small spine directed downwards; the inferiors are three-fourths as long as the superiors, wide apart at base, more divaricate than the superiors, slender, tapering, obtuse, suddenly curved upwards at three-fourths the distance to their tips, with a deep obtuse stria on their external basal half. Legs black, coxæ generally more or less yellow exteriorly; anterior femora with a broad posterior yellow vitta slightly abbreviated, but never covering less than five-sixths of their length. Wings hyaline, almost always slightly flavescent at base; costal vein anteriorly yellow to the commencement of the pterostigma, occasionally only to the nodus; the other veins and cross-veins black; pterostigma brown, sometimes yellowish brown, surmounting 4—5 cells; membranule cinereous. Antecubitals 14—15; postcubitals 10—13. Two discoidal areolet, commencing generally with three; occasionally with two in the upper wing, but never in the lower wing.

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The ♀ has a short, robust, conical black thorn at each extremity of the vertical vesicle, rising about as high as the ocellus does. The upper edge of the occiput is bent forwards in the middle, so as to appear emarginate when viewed obliquely from above; in one somewhat immature specimen the central lobe of the labium is yellow; in another specimen the tip of the intermediate femur is posteriorly yellow. All my ♀ specimens have, in addition to the prothoracic spots of ♂, a small additional transverse spot, occupying only the middle of the posterior prothoracic lobe. The earlets (*oreillettes*) are subobsolete. The abdominal appendages black, pubescent, half as long again as the last abdominal joint, wide apart at base, cylindrical, slender, very slightly curved downwards, acute, surmounting a transversely semioval anal process, which only extends to one-half their length. Vulvar lamina black, polished, more than half as long as the ninth segment, elongate-conical, curved upwards, contracted in its middle, with a deep, longitudinal suture, its tips bifid and approximate. Antecubitals 13—16; postcubitals 11—13.

Length ♂ 53—55 mill.; ♀ 53—55 mill. Alar expanse ♂ 60—67 mill.; ♀ 63—72 mill. Pterostigma ♂ ♀ about $3\frac{1}{2}$ mill. Described from eleven ♂, three ♀.

There exist in the United States three distinct, but closely allied species, representing the *Gomphus vulgarissimus* of Europe, the third one of which is now for the first time described. The first is the *G. fraternus* of Say; the second the *G. adelphus* of Selys. What is very remarkable, they are all three of them nearly alike in the shape of the superior ♂ abdominal appendage, and unlike their European prototype in that important character, which is usually different in every different species. In *vulgarissimus* it is much more robust than in *vastus*, and when viewed laterally it is obliquely truncate at tip below, without any inferior thorn. (See Monogr. p. 131 and Plate VII., fig. 6.) In our three species it is as I have described it in *vastus*. As the three resemble each other very closely, it may perhaps be useful to tabulate their principal differences.

	<i>G. fraternus.</i>	<i>G. vastus.</i>	<i>G. adelphus.</i> (From "Monogr.," p. 414.)
Average length	56 millimetres	54 millimetres	43 millimetres
Thorn at each end of } ♀ vertical vesicle* }	Long, slender, yellowish	Short, robust, black	* * *
Front, anterior surface	Yellow	{ Yellow, banded with black }	Yellow ?
Back of occiput	{ Yellow, black at the sides }	{ Yellow, black at the sides }	All black
Spot, behind eyes	{ Three, yellow, often confluent }	{ Two, yellow, never confluent }	* * *
Posterior prothoracic } lobe }	Entirely yellow	{ Black ♂, only cen- trally yellow in ♀ }	* * *
Dorsum of 8th ab- } dominal segment }	A basal yellow vitta	Black	{ A basal yellow vitta, semiobsolete }
8th abdominal segment	{ Yellow at base on the lateral margin }	{ Yellow at base on the lateral sub- margin }	Entirely black
Expanse of 8th ab- } dominal segment }	$4\frac{1}{2}$ millimetres	7 millimetres	* * *
Width of 8th ventral } segment }	$2\frac{1}{2}$ millimetres	$3\frac{1}{2}$ millimetres	* * *
Vulvar lamina of ♀	{ Obtuse at tips and curved strongly outward }	{ Acute at tips, and curving moderate- ly upwards, tips approximate }	♀ unknown
Length of pterostigma	About $3\frac{1}{2}$ millimetres	About $3\frac{1}{2}$ millimetres	2 millimetres

* I have myself observed this curious character to exist always in ♀ *Gomphus fraternus*, Say, in ♀ *G. fluviatilis*, mihi. in ♀ *G. annicola*, mihi, and also in ♀ *Macrogomphus? spiniceps*, mihi, but never in the ♂ of the first three species, of which alone I possess the ♂. In ♀ *G. grasilis*, mihi, it is obsolete. It has likewise been described in the "Monographie" as existing in ♀ *Gomphus spinosus*, and, as before stated, in ♀ *Macrogomphus parallelograma* and in ♀ *M. annulatus*; and in the descriptions of the ♂ ♂ of these same three species, no mention is made 1862.]

Early in the summer of 1860 I sent a single ♀ *vastus* along with a ♂ *fraternus*, to Dr. Hagen, supposing them to be identical. In his reply he kindly pointed out three of the principal distinguishing characters, and informed me that he had received from Maryland another ♀ of the same species, which he had named *vastus*—the ♂ being to this day, I presume, unknown to him. In a subsequent letter he said that "*vastus* was PROBABLY a new species." It will be noticed that *vastus* is not included in the Synopsis. The reason I do not know; but I conjecture, from collating the description of ♀ *Gomphus vulgatissimus*, that until the discovery of ♂ *vastus*, it was difficult or impossible either to separate the American species from its European prototype, or to identify the two species satisfactorily. To Dr. Hagen, therefore, justly belongs the honor of attaching his name to this fine and interesting insect; to me belongs only the labor of describing it from an unusually large number of specimens.

GOMPHUS GRASLINELLUS, n. sp.—♂ ♀ Differ from *G. fraternus* only as follows: the posterior prothoracic lobe is black, generally with a central yellow dot; the carina of the dorsum of the thorax is black; the eighth abdominal segment is yellow on the lateral margin for its entire length, and the tibiae are exteriorly yellow, except at the tip. In the ♂ the sheath (*gaine*) of the penis is conspicuously pruinose; and the superior abdominal appendages have a small inferior tooth very near the tip, and in addition a very large quadrangular one on the middle of their external side, as in the European *G. graslini*. (Mon. Gomph., Plate viii., fig. 3.) In the ♀ there is no lateral thorn on the carina of the vertex, and the vulvar scales are only one-sixth as long as the ninth ventral segment, and divaricate from their base.

Length ♂ 50—53 mill.; ♀ 51—53. Expanse ♂ 66—69; ♀ 66—70. Pterostigma $3\frac{1}{2}$ —4 mill. Four ♂, seven ♀. Occurred in Coal Valley Creek, in Rock Island County, and also on the Des Plaines and Chicago rivers in Cook County. Its European representative, *G. graslini*, has black markings on the front, the carina of the thoracic dorsum yellow, and two yellow vittæ (anterior and posterior?) on the outside of all the thighs, whereas *graslinellus*, like *fraternus*, has only a posterior yellow vitta on the anterior femora.

GOMPHUS FLUVIALIS, n. sp.—♂ Obscure greenish yellow. Head with the occiput straight, narrowly margined on its sides before and behind with black, and with long, black ciliations; vertical vesicle black, cariniform, abbreviated, transverse, emarginate, slightly tubercled at each extremity; antennæ, and the whole region of the ocelli to the base of the occiput, black; seta of antennæ generally pale at tip; front sharply and squarely angulated, not as prominent as in *fraternus*, with its upper side basally fasciate with palish brown, the anterior edge of the fascia widely biemarginate; anterior surface of front with its upper half and its two transverse foveæ, generally palish brown, and its inferior corners brown; epistoma clouded with brown; labrum anteriorly margined with brown and with a brown vitta; extreme tips of mandibles, and the terminal processes of the lateral labial lobes, pale brown; back part of the head brown next the occiput. Prothorax brown black, anteriorly and laterally yellow, and uniformly with a double yellow spot immediately before its posterior lobe. Dorsum of the thorax with the dorsal carina, which is not higher than usual, always brown black from its bifurcation backwards, generally in front of the bifurcation brown black except its extreme edge above; a double, central, brown-black, wedge-shaped stripe, not attaining the anterior edge by a third or half millimetre, and narrowly confluent before and behind with the antehumeral, occasionally not confluent before; a wide brown black

of any such appendage. I suspect that I am the first to announce it as a normal, or perhaps only an occasional, ♀ sexual character of the great genus *Gomphus*. At all events no such character is enumerated in the list of the sexual distinctions of that genus in the "Monographie," (p. 11.) Similar sexual appendages on the head are elsewhere in the Class Insecta (genuina), so far as I recollect at present, found not on the ♀ but on the ♂ head, as in the well-known coleopterous *Phanæus carnifex* and many other lamellicorn species.

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antehumeral stripe attaining the anterior edge, and a brown humeral stripe on the suture; pleura pale or yellowish, with a rather narrow brown stripe before the spiracle, which last is edged with black, and a similar one on the suture behind the spiracle, sometimes subobsolete; antearlar sinus black in front; sternum pale. Abdomen brown black, with joints 7—9 but slightly dilated beneath, and marked with yellow on the dorsum as follows:—joint one, with a large longitudinal oval spot, confluent laterally and basally with a small spot, and together with the three small spots covering its entire length; two, with a lanceolate spot on its entire length; 3—8, with a narrow cuneiform basal spot about 1—1½ millimetres long, sometimes throwing out behind a narrow line, which is often interrupted before the medial suture of the joint, and never quite attains the tip; joints nine and ten with a narrow basal membranous line; laterally joints one, two and ten are yellow, except behind the earlets, which are yellow, with a few small black thorns on their posterior edge, and except also the tip of joint two; joints 3—6 have a small basal triangular yellow spot, becoming gradually smaller, until in six it is subobsolete, and joints 7—9 are submarginally yellow, the yellow in seven and eight more or less mottled with brown at tip; venter pale yellow towards the tip, where it is visible. Superior abdominal appendages half as long as the ninth joint, which is nearly four times as long as the tenth, black, slender, tapering, conical, approximate at base, divaricate, slightly curved downwards for three-fourths their length, the remaining fourth straight, with an inferior carina much curved outwards, and ascending their sides to about half their length, whence it again curves inwards and is produced to their tips; inferior appendages one-fifth shorter and more robust than the superiors, pubescent, black, pale at their internal base, approximate at base, more widely divaricate than the superiors, scarcely tapering, with the lower surface rounded and the upper flat, and finally, just before they attain their furthest limit, hemispherically excavated above, when the tip turns suddenly and almost squarely upwards for ½ or ⅓ millimetre, and terminates acutely. Legs brown black, coxæ and trochanters yellowish, intermediate trochanters brown beneath; anterior femora yellowish inferiorly and posteriorly; tibiae and tarsi in the more mature individuals, deep black. Wings hyaline; veins and cross-veins all, including the costa, black; membranule cinereous; pterostigma pale brown, surmounting 4½—5½ cells. Antecubitals 12—15; postcubitals 9. Two discoidal areolets, commencing always with three behind, sometimes with three before.

The ♀ differs from the ♂ in the vertical vesicle being strongly tubercled at each end, between which and the eye is a robust, conical, black thorn, rising as high as the ocellus; the dorsal thoracic stripes are in one specimen and on one side only confluent with the anterior margin; the cuneiform dorsal spots of the abdomen are sometimes subobsolete; and the abdomen is marginally yellow for its entire length, with an abbreviated submarginal yellow vitta on joints 3—6, which is sometimes confluent with the yellow margin, sometimes separated from it by a black line. Both the anterior and intermediate femora are yellowish inferiorly and posteriorly, and the posterior femora are entirely yellowish, except a terminal superior and anterior black vitta. The earlets are subobsolete. The ♀ abdominal appendages are more than a third as long as the penultimate abdominal joint, black, slender, tapering, wide apart at base, acute, parallel, directed slightly downwards, twice as long as the semi-circular anal process, which is yellowish, and has two black triangular vittæ above. The vulvar lamina is only one millimetre long, fuscous, and terminates in two rather slender divaricating conical branches; and the venter, when visible, has joints 3—6, and the basal two-thirds of eight fuscous. Occasionally there is a very slight flavescence at the base of all four wings, Antecubitals 13—15; postcubitals 7—11.

Length ♂ 51—55 mill. ♀ 48—56 mill. Alar expanse ♂ 65—67 mill. ♀ 67—75 mill. Pterostigma ♂ 3½—4 mill. ♀ 4—4½ mill. Expanse of the eighth 1862.]

abdominal segment 3 mill. Described from 3 ♂, 6 ♀, some rather immature, some tolerably mature. As might have been expected the second joint of the penis is toothed, and is about three and a half times as long as the third joint exclusive of the claws. Belongs to the group "pallidus" of the subgenus *Gomphus*, from the six described species of which group it is separated at once, as well as the following, by the black costal vein.

This insect breeds both in the Mississippi River in North Illinois and in the Ohio River in South Illinois, the pupa crawling out on to the banks to assume the imago form. *G. fraternus*, *G. vastus* and *G. amnicola*, mihi, all likewise breed in the Mississippi River, and it is remarkable that in the same spot and on the same day I have seen *fraternus*, *vastus* and *fluvialis* all coming out of the pupa together in considerable numbers. I suspect that most, if not all, *Gomphi* breed in running, not in stagnant, water. This may explain the fact of my being able to describe no less than six new species of the genus, all obtained within a few miles of the City of Rock Island, which lies on the narrow point of land formed by the confluence of Rock River with the Mississippi. The habits of *fluvialis* are very distinct from those of *fraternus* and *vastus*. The two latter haunt the land, often occurring in flocks a mile and more from the river; and from their frequently alighting they are easy to capture. The former makes long excursions to and fro on the surface of the river, scarcely ever approaching the land except for a second, and then never, so far as I have noticed, alighting. Hence it is exceedingly difficult to capture. My specimens were all obtained by taking them just as they came out of the pupa, and allowing them to live as long as they saw fit, which was generally from three to six days. On June 16, 1861, I took a *vastus* with the *Phryganeide macronema zebratum* in its mouth. *Fluvialis* no doubt feeds exclusively on aquatic insects.

In the autumn of 1860, Dr. Hagen most kindly sent me copies of the magnificent *Monographie des Gomphines* and *Monographie des Calopterygines*. With the assistance of the former, I was enabled confidently to announce *fluvialis* as a new and undescribed species in my premium "Essay on Insects injurious to Vegetation in Illinois," p. 341, (printed in the fourth Volume of the Transactions of the Illinois State Agricultural Society,) which was placed in the hands of the Society January 3, 1861. I had previously sent a ♀ of *fluvialis* to Dr. Hagen, not having myself met with the ♂ till 1861, and was much gratified by afterwards receiving a letter from him in reply, dated Feb. 16, 1861, in which he confirmed my opinion by stating positively that "it forms a new species." I have therefore felt perfectly justified in affixing a name to a species, which I was the first to announce as new, and which is now for the first time described in print.

GOMPHUS AMNICOLA, n. s.—♀ Differs from the normal ♀ of the preceding species only in the following particulars:—1st. The ground color is bright deep yellow. 2d. The vertex is yellow behind the vesicle, and there is a longitudinal rectangular ridge on the centre of the vesicle, giving it the appearance of being tri- not bi-tubercled. 3d. The angulation of the front is not acute, but the angle is obtuse rather than square and has its apex much rounded off. 4th. The basal fascia of the front above is not bi-, but tri-emarginate, viz. one very small and deep central and one large and wide lateral emargination. 5th. The anterior frontal fascia is obsolete. 6th. The labrum is anteriorly margined, but not vittate, with black. 7th. The central lobe of the labium is fuscous at tip and the lateral lobes are tipped with fuscous inside. 8th. The dorsal carina of the thorax is unusually high. 9th. The medial, cuneiform thoracic stripe is much slenderer. 10th. The narrow yellow line separating the humeral from the antehumeral stripe is only half as wide as in *fluvialis*, and is interrupted above; and as a consequence of this and the preceding difference, the antehumeral is very much wider. 11th. The first stripe of the pleura is either interrupted or abbreviated above, and the second is

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reduced to a short line above. 12th. The dorsal markings of the abdomen are similar, but very much wider and continuous to the middle of joint 8. 13th. The vulvar lamina terminates in two robust, approximate, conical branches. Antecubitals 13—15; postcubitals 9—11. Two discoidal cellules, commencing with 2 in the front wings, with 3 on the hind wings.

The ♂ differs in the same way, except that the vitta on the dorsum of the abdomen is interrupted at the tips of joints 6 and 7, and is narrower than in ♀. The abdominal appendages are precisely like those of ♂ *fluvialis*, except that the hemispherical excavation at the tip of the lower ones is obsolete. Antecubitals 11—13; postcubitals 9—11.

Length ♂ 47—48 mill. ♀ 48—50 mill. Expanse ♂ 65—67 mill. ♀ 70—73 mill. Pterostigma $3\frac{1}{2}$ —4 mill. Four ♂, eight ♀.

The following measurements of the six new Gomphi previously described have been taken from single specimens; and for the sake of comparison I have added those of some allied species, for which, except that of *fraternus*, I am indebted to the *Monographie*. The figures represent millimetres.

	Total length	Abdo- men.	Post. femur.	Width head.	Sup. wing.	Its width.	Inf. wing.	Its width.	Average Pteros- tigma.
[H]erpetogomphus? rupin- sulis ♂, n. sp.	54	38	7	$7\frac{1}{2}$	33	$7\frac{1}{2}$	31	$9\frac{1}{2}$	$3\frac{1}{2}$
Erpetogomphus cophias ♂	47	34	6	7	32	$7\frac{1}{2}$	30	9	$3\frac{1}{2}$
Macrogomphus? spiniceps ♀ n. sp.	61	45	7	8	39	$8\frac{1}{2}$	37	10	5
Macrogomphus parallelo- gramma ♀	62	47	$4\frac{1}{2}$ †	$8\frac{1}{2}$	42	**	41	**	4
Macrogomphus annulatus ♀	66	49	**	$8\frac{1}{2}$	40	$8\frac{1}{2}$	38	$9\frac{1}{2}$	5
Gomphus fraternus ♂	53	38	$8\frac{1}{2}$	$7\frac{1}{2}$	32	7	30	$9\frac{1}{2}$	$3\frac{1}{2}$
" vastus ♂ n. sp.	56	$40\frac{1}{2}$	8	$7\frac{1}{2}$	33	$7\frac{1}{2}$	32	$9\frac{1}{2}$	3
" fluvialis ♀ n. sp.	52	38	7	$7\frac{1}{2}$	35	$7\frac{1}{2}$	33	$9\frac{1}{2}$	$4\frac{1}{2}$
" annicola ♀ "	47	35	7	7	34	$7\frac{1}{2}$	33	9	4
" pilipes ♀	48	34	$8\frac{1}{2}$	8	34	$7\frac{1}{2}$	$33\frac{1}{2}$	10	4 1-12
" grasilinellus ♂ n. sp.	52	36	8	$7\frac{1}{2}$	32	$7\frac{1}{2}$	31	10	$3\frac{1}{2}$
" erasline ♂	47	33	$7\frac{1}{2}$	7	$3\frac{1}{2}$	$6\frac{1}{2}$	$29\frac{1}{2}$	8	$3\frac{1}{2}$

CORDULEGASTER OBLIQUUS, Say ♀. ANAX JUNIUS, Drury! ÆSCHNA CLEPSYDRA, Say ♂ ♀! [♀ undescribed.] ÆSCHNA CONSTRICTA, Say! ÆSCHNA HEROS, Fabr. ÆSCHNA PENTACANTHA, Ramb. ♂ ♀; [not hitherto found north of Louisiana; ♀ undescribed.]

ODONATA (LIBELLULINA.)

MACROMIA ILLINOIENSIS, n. sp.—♀ Brown. Head with the vertical vesicle bilobed, the lobes divaricate, each forming an equilateral triangle; antennæ black; front prominent, laterally contracted towards its summit, deeply excavated above, the angulation of the superior with the anterior surface much rounded off except at the sides, above black with violet reflections, with four separate, basal, obtrigonal yellow spots, two outside the excavation, two inside the anterior surface, with its upper half brown and its lower half yellow, the latter enclosing the two usual transverse striæ, which are widely and deeply impressed, but not acute; epistoma and labrum of a paler semi-transparent brown, the latter with a wide obtuse longitudinal carina, and obscurely yellow towards its tip in the middle, its anterior edge brown; tips of the mandibles

† I give this figure just as I find it, but I am pretty sure there is some clerical or typographical error here, and that $4\frac{1}{2}$ should be replaced by $7\frac{1}{2}$. *Macr. robustus* ♂, a species of the same size within a millimetre or two, is said to have its posterior femur $7\frac{3}{4}$ millimetres long, and it is difficult to see how a Gomphine as large as this, with the posterior femur only $4\frac{1}{2}$ millimeters long, could have a hind leg extending to the middle of the third abdominal segment, which is given as one of the characters of the subgenus *Macrogomphus*. Unfortunately in the third species of *Macrogomphus* (*annulatus*) the dimensions of the posterior femur are omitted.

black, glabrous; the rest of the mouth pale semi-transparent brown; back part of the head black, polished, without any hair next the eyes. Thorax covered with dense, long, pale brown hair; the space included in the double edge of each posterior bifurcation of the dorsal carina, bright yellow; no indications of any stripes on the dorsum; pleura with a distinct yellow stripe enclosing the spiracle; sternum pale brown. Abdomen inflated at base to the middle of joint three, thence much compressed and carinate above, pubescent, black, except joint one and the basal half of two, which are pale brown; two with a marginal yellow spot on each side underneath at its base, and a yellow medial transverse line, interrupted slightly above, beneath much abbreviated; 3—6 each with an elongate, semi-oval, yellow spot on each side the dorsum, the straight side of the spot on the medial suture, and the spot itself covering two-thirds the distance from the suture to the base of the joint; seven with a dorsal semicircular basal spot extending to the medial suture, and confluent at its extreme tip, with a similar but very much smaller yellow spot immediately behind the suture; laterally three has a lanceolate basal and marginal yellow spot extending two-thirds of its length, and four and eight have a small, obscure, basal, triangular yellow spot; venter black, so far as visible. Abdominal appendages a little longer than the tenth abdominal joint, black, rather slender, depressed, directed downwards, suddenly curving on their inner edge to an acute point, each surmounting a semicircular, black anal process as long as itself. Vulvar lamina black, very small, composed of two very small, approximate, roundish tubercles, from which proceed two robust, widely divaricate, medially inflated branches, convex in front, concave behind, and with a blunt, subbasal tooth on their posterior edge. Legs black; coxæ and trochanters pale brown, except the anterior trochanters, which are distinctly yellow on their inferior surface. Wings hyaline, strongly flavescent at their extreme costal base, and moderately so on their terminal third, the flavescence in the anterior wing extending inwardly along the costa beyond the nodus; a distinct ferruginous stripe between the costal and subcostal veins, extending from the base of each wing nearly to the first cross-vein; veins and cross-veins black, except the upper of the two veins which coalesce to form the costal, which in the lower wing, from a little inside the nodus to the tip of the pterostigma, is yellowish anteriorly; membranule white, cinereous at tip; pterostigma trapezoidal, black. Triangles with one cross-vein, in one posterior wing with two. Antecubitals 18; postcubitals 9—10. Two discoidal areolets, commencing with three, except one anterior wing where it commences with two.

Length ♀ 64 mill. Alar expanse ♀ 100 mill. Hind femur 12 mill.; hind tibia 11 mill. Pterostigma 3 mill. One ♀; ♂ unknown. Abdominal joints 4—6 are equal; seven is about a fifth shorter than six, and 8—10 each about a third shorter than the joint immediately preceding it, ten being about one and a half millimetres long. The hind legs extend to the middle of the fifth abdominal joint. Very distinct in its ornamentation from all the described *N. A.* species, except *pacifica*, Hagen, of which only a fragmentary specimen exists, and sufficiently distinct from that by the greater number of its antecubitals, (eighteen instead of sixteen,) but especially by the coloration of its wings.

MACROMIA FLAVIPENNIS, n. sp.—♀ Differs from the preceding as follows:—the front above is entirely yellow, except a broad, fuscous vitta in the excavation. Each side of the dorsum of the thorax there is a yellow stripe. Joint two of abdomen has a subbasal, yellow fascia, extending on the inferior margin to the tip, narrowly interrupted above, and occupying one-half its surface; in joint three the spot is similar to that of the preceding, but longer; 4—7 marked as is seven in the preceding, and eight with a basal, semicircular spot on the dorsum, occupying nearly one-half its length; laterally the small, obscure, basal spot is visible only in eight, instead of 4 and 8. The vulvar lamina is apparently composed of one large central tubercle, and two robust, inflated branches curving upwards. The wings are entirely flavescent, very strongly so on the

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costa; the ferruginous basal stripe, between the costal and subcostal, is only half as long; costal vein in all four wings yellow to its extreme tip; triangles all with one cross-vein. Antecubitals 17—18; postcubitals 10—11; two discoidal areolets, commencing with three in all the wings.

Length ♀ 69 mill. Expanse ♀ 94 mill. Pterostigma 3 mill. Hind femora 12 mill.; hind tibiæ 11 mill. One ♀; ♂ unknown. Distinct from all described N. A. species, by the yellow costal veins. The front and abdomen resemble those of *annulata*, Hagen, but the dorsum of the thorax in that species is immaculate, and the pleura has two yellow stripes. Occurred on the Des Plaines River, near Chicago.

CORDULIA TENEBROSA? Say.—*C. filosa*, Hagen, and *C. tenebrosa*, Say, are evidently, from the differences in their ♂ abdominal appendages, very distinct species; and of both these species only the ♂ is known. The following ♀ may be referred with some propriety to either, though I rather incline to the opinion that it is *tenebrosa*. Probably some particulars may be mentioned below, which may serve either to identify it with Dr. Hagen's species, or to separate it effectually.

The abdomen is shaped quite differently in ♂ ♀ *Cordulia lateralis*, Burm., the ♂ abdomen having a strong constriction on segment three, after which it tapers to the tip; and the ♀ abdomen having no constriction whatever, but tapering gradually from base to tip, and being much wider and more depressed than the ♂. I presume that the same distinction prevails in other species of the genus, and that the abdominal constriction noticed both in *filosa*, Hagen, and in *tenebrosa*, Say, is merely a ♂ sexual character. Again, the ♀ ♀ of *C. lateralis*, have almost always hyaline wings, but I have a single, immature ♀ specimen, captured at the same time and place with many maturer individuals, with hyaline wings, which has the wings partly fumose; and *C. albicincta*, according to the Synopsis, has the anterior margin of ♀ wings subflavescent, while the ♂ has hyaline wings. The marginal flavescence on the wings of my ♀ ought not, therefore, to afford any reason for considering it distinct from either Dr. Hagen's or Say's ♂, both of which have hyaline wings.

♀ Obscure, brassy green. Vesicle of the vertex obviously punctured, with long, dense, black hairs, truncate-triangular, its tip with an impressed longitudinal indentation extending half way to its base, brown at tip, black with a slight brassy green reflection at base; antennæ black; front coarsely and confluent punctured above, on the upper two-thirds of its anterior surface with very coarse punctures mixed with rugæ, the punctures lower down becoming obsolete; the punctate surfaces bright, brassy green, bordered laterally and anteriorly with a yellow line, the anterior yellow line straight; the rest of the front, the epistoma and the labrum semitransparent obscure greenish; labium yellowish. Dorsum of thorax, with the carina yellowish, otherwise immaculate; pleura somewhat polished, with blue reflections, and with two distinct yellow stripes, one before the spiracle, slightly abbreviated and narrower, another behind the spiracle much abbreviated above, slightly below, and wider; sternum pale greenish brown. Abdomen a little inflated at base above, and tapering regularly to its tip, where it is blackish; glabrous and black below the lateral carina, with a large, obscurely defined, yellowish spot on the second segment beneath, and the basal half of the third segment semitransparent below, so as to appear yellowish; joints eight and nine greenish black below the lateral carina; joint ten triangularly emarginate at its tip for one-half its length. Abdominal appendages long, slender, black, wide apart at base, pilose, opaque, slightly smaller at base, thence cylindrical, till towards the tip they contract and terminate obtusely; viewed laterally, they curve very slightly downwards; viewed from above, they curve slightly inwards for quarter their length, and then divaricate slightly in a straight line; superior anal process very short, semicircular, black, deflexed. Vulvar lamina extending nearly to the tip of joint ten, divaricate with the venter, black, glabrous, polished, its inferior surface a hollow semi-cylinder, with its concavity upwards, rounded at 1862.]

tip and prolonged on each side not far from the tip in a lateral, horizontal, lamina, which at first expands gradually in width towards the base, and finally sweeps round in a regular curve inwards to the tip of joint eight, where the sides of that joint close upon it. Legs black, basal half of the anterior femora, and their trochanters yellowish; the extreme base of the intermediate femora and their trochanters marked with yellowish; all six coxæ pale, obscure green. Wings hyaline, the anteriors flavescent at their extreme base, and on the costa from about the nodus to the pterostigma; the inferiors flavescent at base, especially next the membranule, and on the costa from inside the nodus to the pterostigma; veins and cross-veins black; pterostigma small, black, surmounting not quite one cell; membranule fuscous, whitish at its extreme base. Antecubitals eight, postcubitals six. Discoidal areolets two, commencing always with two.

Length ♀ 60 mill. Alar expanse ♀ 83 mill. Pterostigma ♀ $2\frac{1}{2}$ mill. Abdominal appendages ♀ $3\frac{1}{2}$ mill. One ♀; ♂ unknown. Joints 8—10 of the abdomen are each from one-half to one-third shorter than the joint immediately preceding it, joint ten about one and a quarter mill. long. The only difficulty in referring this insect to Say's ♂, is the yellowish spot which he speaks of behind the two thoracic vitæ; but the existence of such a spot on the thorax is so contrary to the normal style of ornamentation in odonata, that it is probable that it was the spot on the base of the abdomen which he inadvertently referred to. Dr. Hagen's ♂ agrees exactly in the antecubitals and postcubitals, but has only "two obsolete yellow lines" on the pleura, instead of two well developed yellow stripes. Both in Say's ♂ and in Dr. Hagen's ♂, the legs are "black" or "immaculate."

EPITHECA PRINCEPS, Hagen, [occurred on the Des Plaines River.] CORDULIA LATERALIS ♂ ♀ Burm.! [The ♂ has the anal angle of the posterior wings acute, and it cannot therefore be an *Epitheca*.] PANTALA HYMENEA ♂ ♀ Say! [occurs both in North and South Illinois; not captured North of Texas since Say's time; has the same migratory and social habits as *Libellula quadrimaculata*, Linn., but unlike that species never alights to devour its prey, and is consequently very difficult to capture.] TRAMEA LACERATA, Hagen! [occurs both in North and South Illinois.] CELITHEMIS EPONINA, Drury! CELITHEMIS ELISA, Hagen. [Referred to *Diplax* by Dr. Hagen, but I think erroneously. The pair I possess were given me by my friend Mr. A. Bolter of Chicago, at which place he took them.] PLATHEMIS TRIMACULATA, De Geer! [N. and S. Illinois.] LIBELLULA QUADRICOLORATA, Linn.! LIB. SEMIFASCIATA, Burm., [occurred on the Des Plaines River.] LIB. LUCTUOSA, Burm.! LIB. PULCHRELLA, Drury! [N. and S. Illinois.] MESOTHEMIS SIMPLICICOLLIS, Say! MES. CORRUPTA, Hagen! [N. and S. Illinois.] MES. LONGIPENNIS, Burm.! DIPLAX [assimilata, Uhler =] RUBICUNDULA, Say. DIPL. VICINA, Hagen! DIPL. SEMICINCTA, Say. DIPL. AMBIGUA, Rambur. DIPL. INTACTA, Hagen.

I am satisfied that *Diplax assimilata*, Uhler, (No. 1 of the Synopsis, and named *assimilata* for me by Dr. Hagen himself,) is the true *rubicundula*, Say, and that *Diplax* No. 6, (*ambigua*, Rbr.,) is erroneously identified with Say's species. Say describes his *rubicundula* as occurring sometimes with the basal half of the wings flavescent, which is true of No. 1, but untrue of No. 6. No. 6 positively swarms at Rock Island every year about the last of August, and continues till the frosts come; and although I have seen millions of specimens on the wing, and have looked out two seasons for such variations, I never yet saw one with the basal half of the wings even subflavescent. Again, Say gives one and a half inch as the length of his species; now, that is the average length of No. 1, whereas No. 6 averages only about one and a quarter inch, and is constant in size. Mr. Uhler, at the time he published his *assimilata*, had never, as he has informed me, seen any specimens with perfectly hyaline wings. I forwarded such to him last autumn, and I believe he now inclines to think that my view of the subject is correct. The two species are distinguishable at once by No. 1 having both its anterior and intermediate femora posteriorly vittate with yellow.

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low, while No. 6 has a posterior yellow vitta only on its anterior femora. It is unfortunate that Say in his description should have said merely "feet blackish," which decides nothing either one way or the other. Thus by the brevity of the descriptions of the early naturalists, their meaning often becomes an enigma, and we are reduced to guessing and dogmatizing. And yet guessing is not knowing, and faith is not science. There is a profound truth contained in a MS. observation of Dr. Hagen's to me:—"A description of a new species cannot possibly be too long; it is always easy to curtail it, but often impossible to lengthen it."

RECAPITULATION.

<p>TERMITINA. Termes flavipes, Köll.</p> <p>PSOCINA. Psocus venosus, Burm. " contaminatus, Hagen. " novæ-scotiæ, Walk. " lichenatus, Uhler. " purus, n. sp. " semistriatus, n. sp. " perplexus, " " pollutus, " " amabilis, " " geologus, " " abruptus, Hagen. " corruptus, Hagen. " aurantiacus, Hagen.</p>	<p>Palingenia pulchella, n. sp. " terminata, " Ephemera decora, Walk. Cat. " flaveola, n. sp. Ephemerella (n. g.) excrucians, n. sp. " consimilis, " Bætisca (n. g.) obesa, Say, new imago. Cloe ferruginea, n. sp. " fluctuans, " " unicolor, Hagen. " vicina, Hagen, new subimago. " dubia, n. sp. " mendax, " Cænis hilaris, Say, new subimago. —26 sp.</p>
<p>PERLINA. Pteronarcys nobilis, Hagen. Acroneuria abnormis, Newm. " rupinsulensis, n. sp. Perla flavescens, n. sp. " varians, " " decipiens, " " occipitalis? Pict. " producta, n. sp. " fumipennis, n. sp. " elongata, " Chloroperla bilineata? Say. " brunnipennis, n. sp. " nana, " —13 sp.</p>	<p>ODONATA (AGRIONINA). Calopteryx maculata, Beauv. Hætarina rupinsulensis, n. sp. Lestes rectangularis, Say. " unguiculata, Hagen. " hamata, Hagen. " forcipata, Rambur. " eurina? Say. " inæqualis, n. sp. Agrion irene, Hagen. " ramburii, Selys. " exsulans, Hagen. " putridum, Hagen. " apicale, Say. " civile, Hagen. " ——— Hagen, MS., n. sp. " binotatum —16 sp.</p>
<p>EPHEMERINA. Bætis femorata, Say, new imago. " alternata, Say, new subimago. " arida, Say, " " sicca, n. sp. " debilis? Walk. Cat., " Potamanthus cupidus, Say, new imago. " odonatus, n. sp. Palingenia vittigera, " " limbata, Pictet. " bilineata, Say. " flavescens, n. sp. " interpunctata, Say, new subimago.</p>	<p>ODONATA (ÆSCHNINA). Herpetogomphus rupinsulensis, n. sp. Macrogomphus spiniceps, " Gomphus spinosus, Selys. " fraternus, Say. " vastus, Hagen MS., n. sp. " graslinellus, n. sp. " fluvialis, " " amnicola, " Cordulegaster obliquus, Say. Anax junius, Drury. Æschna clepsydra, Say. " constricta, Say.</p>

Æschna heros, Fabr.
 " *pentacantha*, Ramb.
 —14 sp.

ODONATA (LIBELLULINA).

Macromia illinoiensis, n. sp.
 " *flavipennis*, n. sp.
Epithea princeps, Hagen.
Cordulia tenebrosa? Say.
 " *lateralis* Burm.
Pantala hymenæa, Say.
Tramea lacerata, Hagen.
Celithemis eponina, Drury.
 " *elisa*, Hagen.
Plathemis trimaculata, De G.
Libellula quadrimaculata, Linn.
 " *semifasciata*, Burm.
 " *luctuosa*, Burm.
 " *pulchella*, Drury.
Mesothemis simplicicollis, Say.

Mesothemis corrupta, Hagen.
 " *longipennis*, Burm.
Diplax rubicundula, Say.
 " *vicina*, Hagen,
 " *semicincta*, Say.
 " *ambigua*, Ramb.
 " *intacta*, Hagen.

Perithemis domitia, Drury.
 —23 sp.

	Species.	New.
<i>Termitina</i>	1.....	0
<i>Psocina</i>	13.....	6
<i>Perlina</i>	13.....	19
<i>Ephemerina</i>	26.....	16
<i>Agrionina</i>	16.....	4
<i>Æschnina</i>	14.....	6
<i>Libellulina</i>	23.....	2
	106	43

Rock Island, Illinois, July 25, 1862.

Remarks on the Species composing the Genus *PEDIOCAETES*, Baird.

BY D. G. ELLIOTT, F. Z. S.

Intending, at no distant period, to publish a monograph of the *Tetraoninae*, I have been led, by the introduction of an apparently new species of this genus—(lately described by Dr. George Suckley, under the name of *Pediocaetes Kennicotti*, in the Proceedings of the Academy of Natural Sciences of Philadelphia, 1861)—to investigate its specific value, and compare it with our common Sharp-tailed Grouse. The following are my conclusions:

The bird commonly known as *Tetrao phasianellus*, has heretofore only been found within the limits of the United States, and to this species, Ord, in Guthrie's Geog. 2d American ed., 1815, p. 317, gave the appellation of *Phasianus Columbianus*, basing his description upon the Columbia Pheasant of Lewis & Clark, ii. p. 180. This species then seemed to be the only one of this genus existing in the new world, and as it also appeared to be the one—(as far as the knowledge of American ornithologists extended, none of whom had received any examples from without the limits of the Union)—to which, long before, Linnæus had given the name of *phasianellus*, and which Gmelin, Bonaparte, Audubon and all others had retained; so Prof. Baird, when he instituted the present genus, also gave the same appellation as being the correct one of our well known Sharp-tailed Grouse.

But in 1861 there arrived at the Smithsonian Institution, from Mr. Kennicott, a number of Sharp-tailed Grouse, collected in the Hudson's Bay Company's Territory, from Fort Rae and Big Island, the prevailing colors of which were black and white, with very little, if any, of the brown hues, which constitute the principal marks of our common bird.

These examples, Dr. Suckley, after comparison with specimens, obtained from the west and northwest, very naturally considered distinct species, for they certainly are, and thereupon described them as *new*, as above mentioned.

But now I find that this species from Arctic America, is the one originally described as *Tetrao phasianellus*, the United States species either being considered the "young with ferruginous plumage," vide Richardson in Faun. Bor. Amer., 1831, p. 861, or as a very light colored variety.

Thus Bonaparte in his continuation of Wilson's Ornithology, gives a figure of a specimen in the Philadelphia Academy, which, as he says, "though a

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